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STATE DOCUMENTS

MONTANA WATER

Montana Water Resources Board

Newsletter
Winter
1970-71

Legislation Updated

Water Board Explains New Legislative Proposals

Several new legislative proposals are being introduced to the 1971 Legislature by the Montana Water Resources Board this winter. It is felt that these proposals are necessary to the protection of our water and related environment.

RESERVOIR SAFETY LAW

The purpose of this proposed law is to protect the public from unsafe construction, operation and maintenance of water storage structures. The law concerns itself with the proper construction of any structure designed to store water. The law, as proposed, would only effect reservoirs storing 50 acre feet or more of water, or having a height of twenty feet or greater.

The majority of such dams built in Montana are designed by qualified engineers and are properly constructed; however, a small percentage are **not** built properly or have **not** had the necessary engineering design. These often are dangerous and pose a threat to public safety.

Improper maintenance can also render a dam unsafe. Even if the dam structure has been properly designed and built, neglect can cause it to deteriorate to the point of becoming dangerous. Neglect of normal damage by wind action, as an example, can affect the safety of a structure.

Unwise operation of a structure can also make its existence dangerous to people and property downstream.

Although there is already a dam safety law on the books, the existing law requires that three or more persons residing or having property below a dangerous structure have to complain to the Montana Water Resources Board before action can be taken. This law would allow the Water Resources Board to initiate the examination of such dams and dikes upon its own motion.

The responsibilities of the Montana Water Resources Board would also include the approving of all plans and specifications (except federal projects), the issuing of a certificate of approval, and regular inspections at a five-year maximum interval.

The responsibilities of the owners of the structures would include applying for approval, submitting plans and specifications of proposed projects, informing the Water Board of any alterations contemplated on the structure and supplying a certificate of completion.

GROUND WATER CODE AMENDMENTS

The purpose of this bill is to add three definitions directly related to groundwater appropriation forms to the existing law. These definitions are for clarification purposes as there is some confusion as to which form is to be used. Also included in this bill is a means for appropriators to file vested groundwater rights which were not previously filed upon. One of the two valid completion forms can be used. The reasoning for this is that there are still many people who have not filed their groundwater appropriations and they should legally have opportunity to file on these rights.

MODERN WATER CODE

The Modern Water Code calls for a centralized filing system of all surface water rights. These surface water rights are now

(Continued on Page 2)

MONTANA WATER

Montana Water Resources Board Newsletter

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MONTANA WATER RESOURCES BOARD

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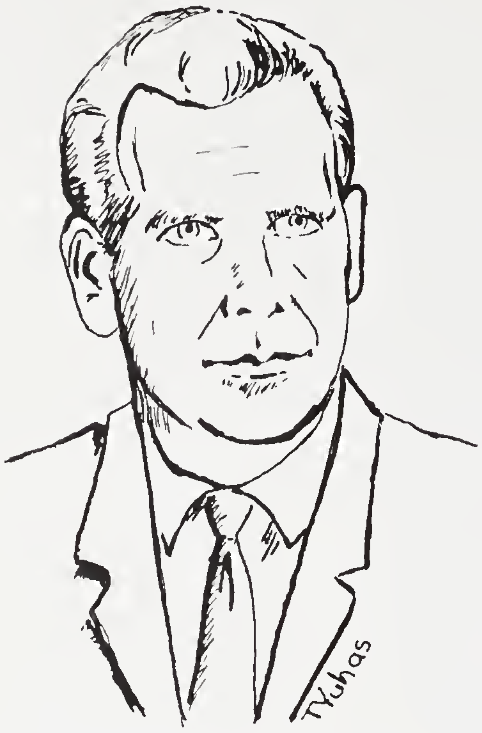
Directors Report



DOUGLAS G. SMITH
Director

As 1970 draws to a close and we look forward to 1971, we have many inspirations, goals and wishes that are not fulfilled. If the 1960's were the age of the economist, the 1970's will be the age of the environmentalist. All of us realize the great heritage we have by being born in such a beautiful and luxuriant state. It concerns many of us to see the polarization of the conservationists versus the preservationists. We all want the same thing for our nation and our state and are aware of the necessary steps that must be taken to preserve and protect our environment, not only for our generation but for future generations unborn.

No one believes that we cannot solve our air, water and land pollution problems if we put our shoulder to the wheel and work together. By cooperation we are not compromising our beliefs but we may accomplish our goals and objects much faster and more intelligently.

None of us have a patent on concern for our environment; nor did any of us just discover our problems. We must never discount the other person's knowledge or concern. All people express in different ways their true feelings and beliefs. Nothing makes a course of action more difficult than when we pledge our cooperation and assistance and then go our own special self-interest ways. We need to strike a balance between the two extremes and remember that the man who fishes on Sunday must have a job to go to on Monday. There is no such thing as an easy answer to a complex problem. There must be orderly development and at the same time protection of our environment.

Water is and will be the key to the wise and prudent utilization of our natural resources. It is our concern and public trust to assist in this wise management of Montana's water and the role it will play in economic as well as environmental development.

Legislation

(Continued from Page 1)

filed with the county clerk and recorder in the county where the water is used. Due to problems of negligence and time, many of the water right filings and water transfers with property deeds are not sent to the Montana Water Resources Board under section (89-813). This new proposal would have the Montana Water Resources Board retain the original copy of the appropriation and then send a copy to the county clerk and recorder.

Another section of this bill names the Montana Water Resources Board as the referee in water disputes. As it stands now, many water disputes are tied up for years in the courts without many benefits from the use of the water. The new law states that the Director of the Montana Water Resources Board act as the mediator; he would supply individual finds of fact in water adjudication suits. After reviewing all evidence of the case and from all available information and records, the court would decide who has a claim to the water. If both parties are not satisfied by the decision they have the right to appeal their case.

Recreation is not presently recognized as a beneficial use of water in the state of Montana. The Montana Water Resources Board feels that for the protection of Montana's water some recognition must be given to recreation as a beneficial use of water without diversion. However, this provision would allow the district court to decide the right of recreational use against other uses for the water now and in the future. If we are going to keep Montana's water within Montana, it is felt that this bill must become a reality.

Although these proposed bills don't rectify every water problem facing Montanans they will, to be sure, be an effective tool to implement future development and provide the control necessary to conserve our water toward a prosperous future.

Governor Speaks

GUEST EDITORIAL
by
Governor Anderson

Editor's Note—Governor Forrest H. Anderson, a Montana native, is one of the few men in the history of Montana politics to serve in all three branches of state government — legislative, judicial and executive. He has always been concerned with Montana's water resources.

The Public Land Law Review Commission on June 20, 1970 submitted its final report to the President and Congress. All of the recommendations will affect Montana. None are more important, however, than those relating to water resources on the public domain.

A large percentage of the lands in this state are federally owned.

Regulations controlling rights to water that rises on federal land are presently misunderstood and incompletely defined.

The Supreme Court in 1963 (Arizona vs. California) ruled that certain public domain such as national forest lands carried with it an implied reservation of sufficient unappropriated water to satisfy the requirements of those lands without regard to state law.

Because of the large areas of public domain in this state, this "implied reservation doctrine" could have a drastic effect on the future of Montana's water resources.

The Public Land Law Review Commission has urged Congress to clarify this matter by requiring the federal government to quantify its water needs.

A definite time limit must be set for quantification of federal rights.

Adequate administration procedures must be established to provide for contesting claims.

Policies must be set to assure adequate compensation where water rights existing under state law may be invalidated.

The Governors of the Western States are in agreement that the implied reservation doctrine must be clearly defined and properly administered.

My office will work with the Congressional Delegation in an effort to assure Montana people the right to Montana water. I will not stand by and let the federal government deprive Montana of its water.

The implied reservation doctrine must be modified and properly administered if Montana is to retain adequate water rights.

The issue of water rights illuminates the dilemma of all states in their relations with the federal government.

Historically, the national government has assumed authority where the states have failed to provide services required by people. If this pattern continues, state governments will no longer exist as viable political units.

State governments are administratively weak and inefficient. They are not responsive to the needs of the people they serve.

If the states cannot do the job, the federal government will and the political power of the state will be further reduced.

Nixon Names Murphy

Representative James E. Murphy (R) has been named by President Nixon to serve on the National Water Commission in Washington, D.C. Murphy, a Missouri native, has been interested and active in Northwest water for over twenty years.

A Kalispell resident since 1946, he has served on the Columbia Interstate Compact Commission and the Pacific Northwest River Basins Commission. Representative Murphy was instrumental in the drafting and passing of the Montana Water Conservancy Law which provides for flood control, recreation, irrigation and water storage. He also proposed the Blue Ribbon Fishing Stream Law which sets aside many of Montana's top fishing streams for recreational and wildlife purposes.

Murphy, along with six other members of the Commission, is charged by the Congress and President with conducting a nationwide water resources study.

Montanans are fortunate to have such a dedicated man representing them on national and state levels.

Representative James E. Murphy

Director Smith presents legislation to television audience

AREA TOUR TERMED SUCCESSFUL

After covering nearly 1700 miles in a four-day span the November area meetings have been headlined as successful. The meetings held during the middle of November in Kalispell, Missoula, Great Falls, Havre, Glasgow, Miles City, Billings, Bozeman and Helena attracted nearly 600 interested Montanans. It was felt an excellent cross-section of each community turned out to discuss a variety of items under the theme, *Montana's Water — The Time Is Now.*

A study of the most frequently questioned areas shows the major interest as centering around the Groundwater Code and the Dam Safety Law. Both of these areas are discussed further in the cover story.

A vast amount of fruitful information was obtained at the meetings pertaining to the future direction of the Montana Water Resources Board. This constructive input will be digested before any major decisions are made.

The Water Board would like to express their appreciation to those who attended the meetings and made this success possible. We feel that we now have a much better idea of what the people of Montana are thinking in terms of water and water development. It is hoped that more meetings with Montana citizens can be held on a regular basis in the future.

Water Board Personnel Queried

What Fu

Executive Reorgan Conservation O

With executive reorganization a reality the Montana Water Resources Board, like all other state agencies, questioned its future. According to Deputy Director of the Commission on Executive Reorganization, George L. Bousliman, the new plan calls for 18 new departments which will combine the many state organizations now in existence.

The Department of Natural Resources and Conservation is slated to encompass all resource related agencies including the Montana Water Resources Board. Other agencies planned for inclusion are the State Fish and Game Commission, Montana State Board of Forestry and Office of the State Forester, State Soil Conservation Committee, Montana Grass Conservation Commission, Council on Natural Resources & Development, Outdoor Recreation Advisory and Planning Committee, Oil and Gas Conservation Commission and the Advisory Committee for Preservation of Historic Sites.

He said, "Each of the agencies outlined except the Bureau of Mines and Geology, has a common denominator: they are all primarily intended to preserve or conserve a natural resource.

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ation Combines
nted Agencies

The state government's efforts towards responsible conservation and development are divided among eleven agencies or multi-member bodies, each of which serves in an autonomous fashion and primarily concentrates on its specific natural resource. There is, therefore, no broad based agency charged with the comprehensive and coordinated plan for the efficient accomplishment of the development, conservation and protection of Montana's natural resources.

Under the new Department of Natural Resources and Conservation, Bousliman indicated the governing Boards of the State Fish and Game Commission, the Montana Water Resources Board, the Montana State Board of Forestry, the State Soil Conservation Committee and the Montana Grass Conservation Commission be abolished. He emphasized this would not include the agency employees. These multi-membered bodies would be replaced by a five member Board of Natural Resources and Conservation composed of persons informed and experienced in the subject of environmental conservation. Its members would be appointed by the Governor. This Board will perform the quasi-judicial and quasi-legislative functions of the above mentioned governing Boards and be advisory to the Department of Natural Resources and Conservation for all other Department activities.

Bousliman suggested operational agency units of the State Fish and Game Commission, the Montana Water Resources Board and the Montana State Board of Forestry (State Forester) be incorporated in their entirety. All other units would be disassembled and reorganized according to sound administra-

(Continued on Page 7)

CANADIAN WATER---FACT OR FANCY?

According to a November 18, 1970 address by Cleo Mowers, publisher of the Lethbridge Herald, no internation transfer of water will take place unless the subject is approached by Canadians for their own benefit. Mr. Mowers' speech was given to the National Water Resources Association in Las Vegas.

In this speech he pointed to Canada's awakening responsibility to wisely use what is now an abundant water supply. Canadians are greatly concerned about pollution, theirs and ours. The government is adopting a firm and bold policy demanding whoever pollutes shall pay the cost of reversing the pollution. Much study is being conducted to do, in essence, what we in Montana are doing, determining present and future water needs. In fact the present position of numerous persons in British Columbia is, "We don't know how much we have, or how much we may need, so we cannot think of export."

No one can deny the truth in this statement, however, it is Mr. Mowers' opinion the major opposition to any export of Canadian water is emotional. He explained it as "living next to you (the United States) is like sleeping next to an elephant. No matter how even-tempered the beast, every grunt and twitch scares the daylights out of one." This very cautious attitude can be better understood when you realize just how over-powering the American economy, social structure, industry and corporations are. Too many influences operate with such little regard for the international boundary Canada might just as well be the 51st state. It is this fight to maintain a national identity that makes any such long range and imposing contract as the transfer of water a difficult subject to approach.

So where is the key to mutual understanding and common interest? Again quoting Mr. Mowers, "Firstly, get to know us: Secondly, get to know us: Thirdly, get to know us! Most Americans are abysmally ignorant about the elementary facts of Canada. Most Americans don't know what makes us tick, what our problems and prospects are. They don't know because they don't care. They don't even know why they should bother to know. They can afford not to know or care, if they don't expect our understanding or want to do business with us. But, they may want to do business with us."

There are many authorities

(Continued on Page 7)

Sediment . . . Waters Number One Enemy

Soil or sediment is the number one pollutant of the nation's water. Suspended solid pollutants from land runoff reaching the nation's streams is much greater than pollution caused by our sewage discharges.

The Mississippi River delivers 475 million tons of sediment to the Gulf of Mexico each year. This sediment represents the top soil from 475 thousand acres of land.

SEDIMENT IS A NATIONAL PROBLEM. According to the Soil Conservation Service, one-half billion cubic yards of sediment per year is dredged out of the nation's streams, channels and harbors at an average cost of 40 cents per cubic yard.

Sediment damage to the transportation industry alone amounts to millions of dollars each year. Railroads, public highways and navigation channels are all affected. Sediment in river channels and stream beds make the surrounding communities more vulnerable to flood damage. Sediment means higher taxes, higher railroad fares, larger water bills and more frequent requests for disaster funds.

There are several more sources of sediment other than unprotected farm land. These include construction sites, clearcut logging areas, industrial and mine wastes, road beds and even the automobile. All contribute substantially to the overall problem.

Eutrophication is an indirect effect of sediment. Eutrophication refers to natural or artificial addition of nutrients to bodies of water and the effects of these added nutrients.

Chlorinated hydrocarbon pesticides, phosphorus and other nutrients which are absorbed into soil particles are moved into our streams and lakes. These additional nutrients change the plant and animal life in the waters. A common change is the accelerated and excessive growth of algae and other aquatic plants. The algae chokes the open water and makes it nonpotable, then when the organisms die and decompose, the surrounding air and water is fouled. Deep water oxygen, vital for fish and other wildlife, is consumed in this decomposition process.

POLLUTION PREVENTION. As with all cases of pollution, prevention is the cheapest and most effective way of eliminating the problem. The Soil Conservation Service (SCS) for many years, has advocated and instructed ranchers in proper use of conservation in areas of farming and grazing. The SCS is responsible for soil conserving methods such as stubble mulch farming, contour farming, strip cropping, grass and shrub seeding programs and up-stream flood control dams. There is little doubt that without these soil conserving programs the nation's sediment problem would be much greater in magnitude.

A proper chemical fertilizer program is sometimes necessary for pollution prevention.

For example, in almost every instance, fertilizer additions to winter wheat have increased plant density, rooting depth and grain yield. Consequently the soil cover is increased, more soil water is used and additional nutrients are taken up by the crop. Obviously erosion and leeching of nutrients (primarily nitrates) is decreased.

To Sanitary Engineers the use of soil in a sewage disposal system is nothing new. One of the best ways to purify water is to percolate sewage effluent through soil.

Perhaps a more efficient way to use the soil in reclaiming sewage effluent is in an irrigation-cropping system using secondary sewage effluent as irrigation water. Studies show this approach feasible in some parts of the country.

The soil plays an active role in both the **Cause** and the **Elimination** of water pollution. As the knowledge of soils and soil chemistry increases the soil scientist, hopefully, can do much more in making a world with clean H_2O a reality.

> *"Today's water is the only water*
> *that will be available for the future.*
> *There will be no more of it tomorrow*
> *than there is at present.*
> *So that it may be used again and again,*
> *unnecessary contamination*
> *cannot be tolerated.*
> *What mankind does with this precious resource*
> *will determine whether there*
> *will be sufficient usable water*
> *for our children and their children."*

FLOOD PLAIN INSURANCE

PROTECT YOUR PROPERTY

The Montana Water Resources Board has been specifically designated by the Governor to coordinate the Flood Plain Insurance Program in the State of Montana. The program was established under the National Flood Insurance Act of 1968 to make limited amounts of flood insurance, which was previously unavailable from private insurers, available to property owners by means of a Federal subsidy. In return for this subsidy, the Act requires that State and local governments adopt and enforce land use and control measures that will guide future development of land in flood-prone areas in order to avoid or reduce future flood damage.

If a community or rural area is interested in participating in or learning more about the program, it should contact James Nybo, Economist for the Montana Water Resources Board, as he is handling the activities for the Board. Briefly, the steps to be followed are:

1. The community must submit to the Montana Water Resources Board an expression of interest for flood plain insurance or further flood plain information.
2. They must have legal authority to zone flood-prone areas.
3. The community will have to present an outline or summary of local flood problems to the Board. This can be in the form of a map, list of past flood damages, rivers involved in flood problems, etc.

A prerequisite for final qualification is the completion of a flood plain information study, which delineates the flood hazard areas. These studies are generally done by the Corps of Engineers, and the priorities for such studies are determined by the Montana Water Resources Board in conjunction with the Corps, based upon the communities' need of help, damages done by previous floods, etc. Flood Plain Insurance Studies can also be done by the Soil Conservation Service of the U.S.D.A.

An essential element in the wise use of flood plain areas is land use and control measures. Proper zoning of flood plain areas allows adequate room for a large body of water to move through the flooded area and restricts damage-prone construction to less hazardous areas. The fact that current Montana law has no provisions for zoning outside incorporated towns and their immediate vicinity means that all those areas which cannot be zoned cannot qualify for flood plain insurance. These rural districts should not lose hope, however, because the Department of Planning and Economic Development has drafted legislation amending existing statutes to allow meaningful rural zoning for those areas which desire some control over development within their region.

The Montana Water Resources Board has recently been very active in spearheading a move to make Flood Plain Insurance available. In addition to a well-attended Flood Plain Management Meeting held in Helena on October 27, 1970, the subject was discussed during the recent area meetings. Those communities in the state who have had Flood Plain Information studies completed have been encouraged to take the steps to get insurance for their citizens. Minutes of the October 27 meeting as well as a H.U.D. packet on the National Flood Insurance Program are available from the Montana Water Resources Board upon request.

WHAT ? ? ?

(Continued from Page 5)

tive principles and like functions. The Department Director would be appointed by, and responsible to the Governor.

Bousliman closed by saying that the combining of these resource oriented organizations would clarify the authority and responsibility of each, abolishing overlapping responsibilities. He also stated that this plan is subject to approval by the 1971 legislature.

FACT OR FANCY

(Continued from Page 5)

indeed who are looking closer and closer at the wet Canadian Provinces and gingerly exploring the possibility of massive water transfers to the thirsty southwest. Will this imported water be so prohibitively expensive as to force the United States to reevaluate their own water supplies and make more efficient use of the water available? This could be a serious consideration to any potential developments.

If Mr. Mowers has vocalized the current national climate correctly, it would seem to require some extremely diplomatic and straight forward negotiations. One can definitely believe a strong arm technique would be most detrimental.

The key to cooperation, then, is Canadian initiative for Canada's best interest in conjunction with a well documented and extensive plan embodying mutual respect and benefit for both Nations.

News Notes

CORRECTION: In the Fall issue of the NEWSLETTER it was stated that Inventory Series Number Eleven, "AN ATLAS OF WATER RESOURCES IN MONTANA BY HYDROLOGIC BASINS" would be available to the public as soon as printing is completed. However, because of the large size of the Atlas (35x22½) it is almost impossible to mail. We are asking anyone interested in receiving this publication to please stop in the Helena offices of the Montana Water Resources Board to attain it.

* * *

It has been brought to our attention that in the Summer NEWSLETTER the article, "Water Board Conducts Information Tour," erroneously indicates the Crow Creek Unit as being a former Bureau of Reclamation project now owned by local water users. However, this development is still a Bureau project which has been turned over to the Toston Irrigation District for operation and maintenance. As this is a common procedure, we hope to clarify any questions which might have arisen from the previous article.

* * *

The Montana Water Resources Board held a series of five Conservancy District meetings last month. These meetings were held to inform the people in the proposed North Central Conservâncy District and the East Central Conservancy District areas of the findings of the preliminary feasibility studies conducted by the Water Resources Board. The meetings for the North Central District were held in Shelby, Havre, and Glasgow; for the East Central District, in Circle and Jordan. Both reports looked favorable for the proposed districts.

* * *

Testimony was presented November 7th concerning the Miller Creek petition at the University Center on the University of Montana Campus. The hearing was held before the Montana Water Resources Board by interested parties who were seeking a establish a controlled groundwater area along Miller Creek southwest of Missoula. The petition, which was denied by the M.W.R.B., was signed by 38 residents of the proposed groundwater area, to prohibit the further development of a trailer park.

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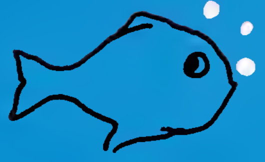
NEW LEGISLATION PROPOSED

MONTANA WATER

RESOURCES BOARD

Newsletter
Fall 1970



Water Board to Conduct State-wide Informative Meetings

The Montana Water Resources Board will be conducting a series of informative meetings throughout the state later this month. Starting in Kalispell the morning of November 16th, members of the Board will present unique and stimulating ideas and issues to the public.

"The purpose of these informative meetings is to instill an awareness of the importance of Montana's water to Montanans", said Douglas G. Smith, Water Board Director. Division Directors Jack Acord of Planning, Orrin Ferris from the Engineering Division, Bob Jensen representing Administration and Ron Guse, Water Resources Division Director, will present information vital to the public's understanding of Montana's water and the function of the Montana Water Resources Board. 'The theme for the tour will be MONTANA'S WATER—THE TIME IS NOW.

AGENDA

The agenda will consist of a presentation entitled, *"What Is the Montana Water Resources Board"* given by Director, Douglas G. Smith. This slide demonstration is designed to inform the listeners of the many and varied functions of the Water Resources Board, the personnel and their goals and expectations.

Following Smith's presentation, *"New Dimensions"* will incorporate presentations from the Division Directors. Proposed changes within the Montana Water Resources Board, a discussion of future innovations and possible public expectations from the Water Board are only a few of the many areas to be touched upon.

Highlight of the sessions will be the presentation of proposed legislation which the Board will present to the 1971 Legislature in hopes of enactment into law. Among ideas put forth will be a name change from the Montana Water Resources Board to the Department of Water Resources. The five member appointed Board will be called the Montana Water Resources Commission. Mr. Smith said, "This name change would be in line with the names of other state agencies in that it separates the personnel section of the Water Resources Board from the appointed Board members."

Another important proposal to be set forth is a new Dam Safety Law. This law, if enacted, would require periodic inspections of all reservoirs over fifty acre feet and all dams over twenty feet in height. The dams would be required to pass rigid inspection which would expose potential hazards before life and property could be devastated.

Also included will be a Modern Water Code which calls for a centralized filing system of water claims and the recognition of Recreation without diversion as a beneficial use of water. However, this provision would allow the district court to remove the recreational right and award it to another party if a more beneficial use is advanced.

A Water Pollution Control Law and Revisions to the Montana Groundwater Code will be presented along with a proposed Flood Plain Insurance Plan which would make it possible for people living in flood areas to insure their property against this catastrophe. Several other items for legislative consideration will also be presented at the meetings in hopes of better informing the populace and soliciting public feeling on these issues of universal importance.

Also accompanying the above mentioned members will be John Serquina, Assistant Office Super-

(Continued on page 4)

A Sign Of The Times

New Look for Old Projects

The signs designating the Montana Water Resources Board projects will have a new look starting this spring. Richard E. Mayer, Landscape Architect for the Council on Natural Resources and Development, is currently working on designing and relocating new signs for all of the projects.

"The old signs have too much text material for the average person to read when he's driving by at 70 miles an hour," says Mayer. "The lettering is too small to read and there are no warnings to the approaches or directions to the final destination."

Dick was assigned the task of creating a new "look" for the more than 800 projects around the state. He researched several areas and contrived styles and shapes of signs to meet the needs of the assignment. "We finally decided on a unique trapezium shape. The reason it's unique is because, as far as I know, no other signs have ever been made that look like this." Each project sign will have the same shape although the size will vary in respect to the function that the sign serves.

The letters will be blue on a natural looking chamois background. Native material will be utilized for construction of the standards whenever possible. The official water board seal made by a metal photo process will be affixed in blue to the sign. These markers will furnish an attractive addition to the area environment and surrounding terrain.

The signs will be relocated to provide better visual contact with the oncoming motorist and be placed to better harmonize with the highway construction.

Signs will mark the approach, entry and direction to the projects. Once the visitor arrives there will also be signs orienting him to the project and explaining the facilities available. In many instances this will be accomplished by relocation of the present informational highway signs to their individual project sites.

Signs have already been routed for the Hamilton Shops. They include two entry signs and two directional signs. The field crews at the shop will construct native stone bases upon which to mount the signs and paint them after they are erected.

With young-thinking people like Dick Mayer working for the betterment of the Montana Water Resources Board, we hope this will be only the first in a long line of invigorating and useful innovations.

Schedule of Informational Meetings

Nov. 16, 1970—Monday
Kalispell:
Eagles Hall—9:00 a.m.
Missoula:
Florence (Governor's Room)—7:00 p.m.
Nov. 17, 1970—Tuesday
Great Falls:
Holiday Inn (Glacier Room)—9:00 a.m.
Havre:
Elks Club (Green Room) —7:00 p.m.
Nov. 18, 1970—Wednesday
Glasgow:
Civic Center—9:00 a.m.
Miles City:
Red Rock (Bunkhouse)—7:00 p.m.
Nov. 19, 1970—Thursday
Billings:
Science Auditorium, Eastern Montana College —9:00 a.m.
Bozeman:
Baxter—7:00 p.m.
Nov. 20, 1970—Friday
Helena:
Jorgensons (Big Sky Room)—9:00 a.m.

PLEASE CLIP AND SAVE

SOMETHING DIFFERENT for the Montana Water Resources Board's NEWSLETTER — a new editor who is James Bond, Public Information Director. Jim, assisted by Shirley Cunningham, is introducing a new format and new design for the Fall issue. Your comments would be appreciated.

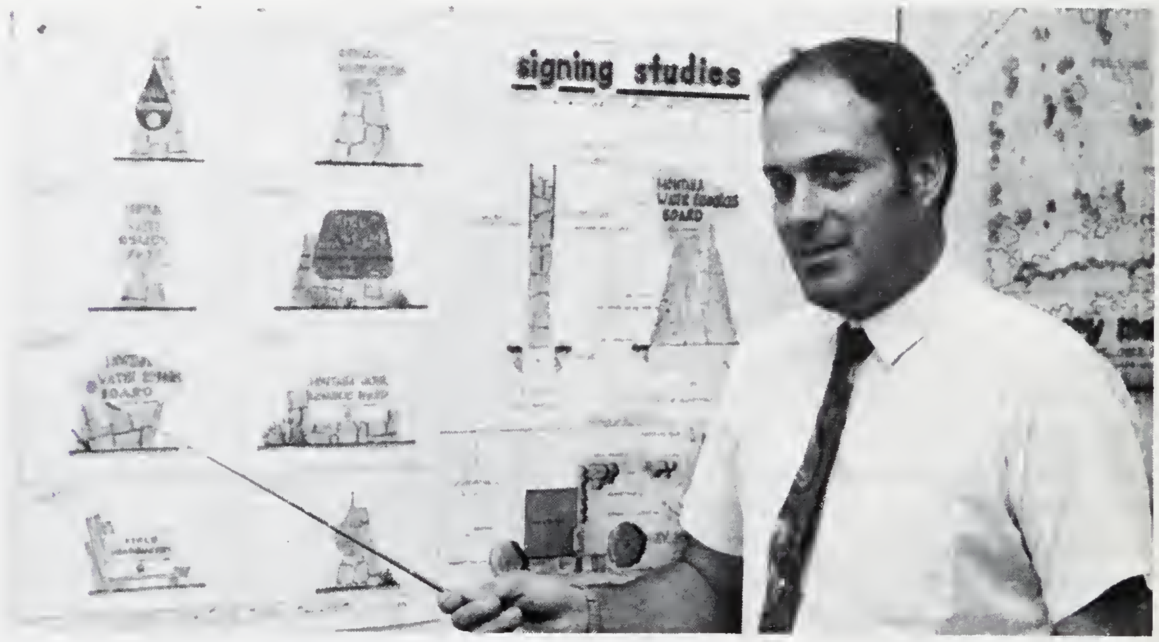
NEW LEGISLATION

(Continued from page 1)

visor, Robert Peter, Microfilm Supervisor and James Bond, Director of Public Information.

The meetings will be held throughout the state starting November 16th in Kalispell and ending November 20th in Helena. The public is cordially invited to attend all of the meetings. Following the information section of the meetings a general question and answer period moderated by Robert Jensen will be held.

It's your water — please attend.



Richard E. Mayer indicates new sign style for Water Board Projects.

NEW FACES

(Continued from page 2)

a Masters is the Board's new Economic Analyst, Montana native, James Nybo. Nybo will conduct research, make projections and coordinate the various studies required by the Montana Water Resources Board as he serves on numerous river basin commissions.

The fifth face on our profile belongs to James Holloran who is coming to us from Billings and is our new Groundwater Supervisor. Jim is also a Texas native and has his B.S. in Geology from Texas Technological College. Jim is responsible for matters pertaining to the administration of the groundwater code and answering inquiries pertaining to the appropriation of groundwater.

Welcome aboard men, we hope your stay is enjoyable. We know that Montana has a fluid future, just watch the water run up-hill . . .

DIRECTOR'S REPORT

(Continued from page 2)

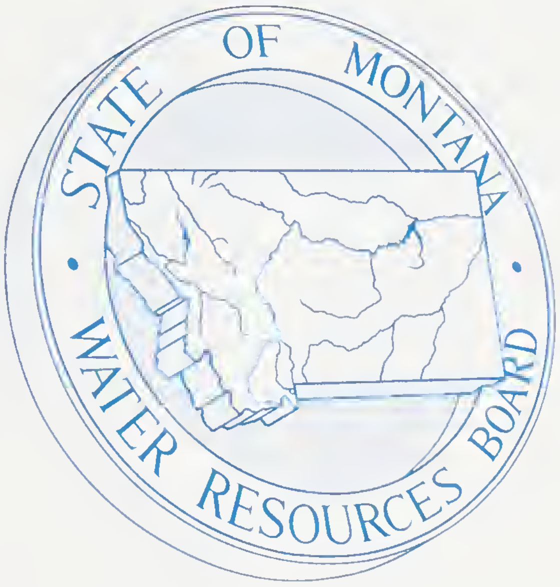
This year we have completed surveys of nine counties with only one remaining which is scheduled for completion next summer. Because this county by county survey has taken 30 years to complete, many of our early surveys already need to be updated.

The Montana Water Resources Board has designed a plan for the redistricting of the state to better facilitate keeping our records current. We are proposing a "ONE-STOP SHOPPING CENTER" whereby people could obtain government services and information at one central location in their area. This would eliminate many duplications of service. We feel everyone in the state can benefit from this area concept design.

The water within the boundaries of Montana belongs to all of us. We must take care of it by planning current and future uses wisely. The Montana Water Resources Board is doing all we can to protect your water, but without your support we can only accomplish a minute portion of our goals . . .

WATER BOARD has NEW SEAL

You have probably noticed in a previous NEWSLETTER the use of a Montana Water Resources Board Seal which is circular with a map of the state of Montana and all major streams engraved in the face. This seal was designed by Tom Yuhas of the Planning Division.



In this Fall issue of the NEWSLETTER we are introducing for the first time a three dimensional seal designed and drawn by Hugh Greenup, Resource Survey Technician from the Water Resource Division. Hugh enjoys op-art and cartooning and has designed the new seal using a simulated relief method. The new seal will be printed with *State of Montana* in gold, *Water Resources Board* and the drainage systems in blue and will be outlined in black.

We are very fortunate to have such talented people working for the Montana Water Resources Board, people who can do more than their assigned tasks.

Pollution Begins at Home

Montana's Water!! Who Protects It?

by Shirley Cunningham

All state agencies, by design and effort, work for the people of Montana—you, the individual. To achieve this aim of constant progress requires something more than a dedicated spirit, however, and a portion of that something is displayed by the Montana Water Resources Board in its ever broadening contacts with federal, state and local organizations whose interests parallel our own.

Have you ever considered the multitude of regional agencies, councils, interstate compacts, federal commissions, local associations and private conferences working to influence if not actually shaping the destiny of that simple, yet oh so precious commodity which we take for granted, water?

There are literally hundreds of dedicated people throughout the state and region who participate in these policy making organizations. The Montana Water Resources Board not only is represented but also actively participates to help meet the growing demands on Montana's water resources in the most efficient manner. It is a simple fact that although the nature, immediacy and gravity of the water resources problem faced by the United States varies greatly from region to region, all parts of the nation either have or will have problems. Because of this fact it is necessary to effectuate a policy to encourage conservation, development and utilization of water and related land resources on a comprehensive and coordinated basis.

One of the most annoying problems plaguing state agencies is that of duplication of services and assessment of priorities. Of real benefit in the unified development of a total resource plan is the Governor's Council on Natural Resources and Development originally established by the Revised Codes of Montana, 1947 and subsequently updated to include members from sixteen resource related agencies. This Council gives joint consideration to administrative problems, legislative needs and devises effective means for coordination and elimination of the duplication of overlapping responsibilities. This body acts in an advisory capacity preparing reports and recommendations in regard to matters which necessitate the Governor's attention or specific directives from the executive office to be acted upon by the Council.

A comparatively new concept in water development is beginning to achieve the full attention it deserves. With overlapping demands from multiple factions for surface water originating in one state but flowing through many, it is to the benefit of all concerned to work together on a regional basis to smooth out problems arising from such diversified claims.

The Pacific Northwest River Basins Commission was established in 1967 at the request of the Governors' of the states of Idaho, Montana, Washington and Wyoming. The purpose of this Commission is to stimulate, coordinate and review plans on a continually up-dating basis while seeking optimum benefits from conservation, developments and utilization of the resources of this Columbia River region.

Another agency devoted to the concept of regional development and effective cooperation is the Western States Water Council formed in 1965 pursuant to a resolution of the Western Governors' Conference. This Council is made up of eleven western states' Governors or their representatives. It is a committee oriented organization with three working committees—the Executive Committee, the Water Policy, and Legislative Committee. The work of the Council is concentrated in those areas wherein the states share a common interest. In 1968 work was centered around irrigation and water quality; in 1969 legislative action and reorganization of several pertinent acts was the focal point of discussion. In 1970 work continues on environmental quality and action for protection of wild and scenic rivers.

In 1945 the Missouri Basin Inter-Agency Committee was formed. The work of this agency is centered around a comprehensive resource development for the Missouri River Basin. Its function has been the interchange of information and coordination of activities in development of this basin. One can better comprehend the magnitude of this project when realizing the Missouri River flows 3,998 miles from its origin to its mouth at the Gulf of Mexico and drains an area of 529,000 square miles—one sixth of the entire nation together with 9,700 square miles of Canada.

One facet of ever widening interest is the protection of our environment. In 1955 the Water Pollution Council was established to fill this need for organization of the state water classification and standards of purity. The vital function this council serves is to prevent, rather than repair, the damage to environment which necessitates the smooth function and cooperation of its members.

And the list of worthwhile and essential special assignments handled by the Montana Water Resources Board and its professional personnel is endless. Such things as representation of the state in international affairs; for example, the operation of the Waterways Treaty with Great Britain concerning the appro-

(Continued on page 7)

MONTANA'S WATER

(Continued from page 6)

priation of the international waters of the Milk and St. Mary Rivers; the allocation of the waters of the Yellowstone River through the Yellowstone River Compact; membership in the National Rivers and Harbors Congress, Inland Empire Water Ways Association; Missouri River States Committee and the Montana Water Development Association.

The benefits of these many, efforts on your behalf give us, in Montana, the unique opportunity to stop major deterioration of the quality and quantity of our state's water and related resources. Voluminous material has been prepared, much personal effort expended in the concern of this agency involved in the zealous stewardship of protecting our state resources.

Pool Formed

Last month Board Director, Douglas G. Smith, signed an agreement with Lewis Chittim, State Highway Engineer for the Montana State Highway Commission, for the establishment and operation of a state Motor Pool. Under the new agreement the Highway Commission will furnish all passenger vehicles with gasoline, oil and routine service materials along with performing all maintenance on the vehicles at a blanket charge of nine cents per mile.

The provision for the motor pool grew out of the 1969 Montana Legislative Session. In that session the legislators asked all state agencies to establish a joint motor pool to cut down on duplication of services and unnecessary expenses.

Although the Water Resources Board and the Highway Commission are the first two state agencies to combine in a joint motor pool, it is expected that the other state agencies will follow the example set forth by Smith and Chittim.

According to Mr. Smith this should result in a substantial savings to both Departments. "In gas alone, we should be able to save the Board close to $700 a month," said Smith.

GUEST EDITORIAL

(Continued from Page 3)

it better to work for improved methods of dam construction and regulate stream flows to the advantage of fish and recreation, along with the other beneficiaries such as industry and irrigation. By so doing, we all benefit.

A good example is the Madison and Missouri River. Beginning at Hebgen Lake near West Yellowstone, and extending to Cascade, we find six dams controlling the river flow, and all stretches of these streams are considered Blue Ribbon fishing streams, and the lakes formed by the dams are providing some of the finest boating and fishing in Montana. In addition, we have power production, small and large industry, and irrigation. This is the type of development that makes Montana such a fine place in which to live.

I submit that this is the type of development needed in Montana to provide our own people and our children with a quality environment.

However, if we are to have more of this, we must get busy and utilize the tools available to us. We must work for funding at the state level for the Montana Water Resources Board, and at the national level for the Soil Conservation Service and the Bureau of Reclamation.

This type of development doesn't cost—it pays.

News Notes

A study of the feasibility of desalting groundwater in eastern Montana has been given the go-ahead by the Board. Low of three bidders to make the study of improving water quality for ten communities in the Circle-Jordan area was Control Systems Research of Arlington, Virginia. The study will determine whether it is economically feasible to treat salt laden water sources and then use them as an alternate supply for domestic and municipal uses.

Final approval for the study will be up to the Office of Saline Water, an agency of the Interior Department, which will finance the study. The proposed study would involve water supplies of Circle, Roundup, Froid, Ryegate, Wolf Point, Richey, Fairview, Nashua, Wibaux, Geraldine, Plentywood, Hinsdale, Musselshell and Rapelje.

The Hi-Line Water Conservancy District Plan was described by Robert A. Rohling of Henningson, Durham & Richardson as "economically feasible." HDR in joint effort with Parsons, Brinkerhoff, Quade & Douglas, Inc. of New York have completed the preliminary study of the nine county area stretching from the Fort Peck Reservoir to Glacier County. Counties all or partly in the area are Glacier, Toole, Chouteau, Liberty, Hill, Blaine, Phillips, Valley and Pondera.

Lewis Chittim, State Highway Engineer (left) and Douglas G. Smith signing motor pool agreement.

News Notes

(Continued from Page 7)

The publication GROUNDWATER IN MONTANA (Inventory Series Report Number 16) is now back from the publisher. The study is the most substantial effort to date to estimate the quality and quantity of groundwater within Montana. This report was initiated by the Montana Water Resources Board as part of the inventory phase of the Comprehensive State Water Plan and prepared by the Montana Bureau of Mines and Geology under contract with the Water Resources Board.

Also recently released are Inventory Series Reports Numbers Two and Ten. Number Two is entitled WATER RESOURCES PROGRAMS CONDUCTED BY GOVERNMENT AGENCIES IN MONTANA and is an inventory and description of the activities of Federal and State government agencies in water resources development. Number Ten, entitled BIBLIOGRAPHY OF MONTANA WATER RESOURCES AND RELATED PUBLICATIONS lists all of the known printed information, both published and unpublished, available to the Montana Water Resources Board.

Soon to be made available to the public will be Inventory Series Numbers Eleven and Twelve. AN ATLAS OF WATER RESOURCES IN MONTANA BY HYDROGOLIC BASINS (Number 11) and MONTANA'S STATE WATER PLAN PROGRESS REPORT July 1, 1967 to December 31, 1970 (Number 12).

All of the above publications are available without cost from the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601.

The Montana Chamber of Commerce has made available the results of their Agri-Business survey conducted this past summer. The responses to the question "In the area of water development, the Montana Chamber of Commerce should . . ." were as follows; Twenty-eight percent said the Chamber should "Protect Montana water rights"; Fifteen percent felt they should, "Cooperate with other agencies." "Encourage irrigation" and "Build small dams" both received eleven percent favorable responses.

Director Douglas G. Smith accompanied by Orrin Ferris, Chief Engineer, completed their yearly inspection of the Sage Creek Drainage Basin just north of Havre. The annual inspection is to clear any water disputes along the basin which stretches from southeast Alberta across the International Boundary into northern Montana.

SOMETHING NEW has been added to the NEWSLETTER this quarter—the cartooning and line drawing by Tom Yuhas. Tom works in our Planning Division as a draftsman. He is a Helena native and has a degree in Applied Art from Carroll College in Helena. His hobby, naturally . . . drawing.

MONTANA WATER RESOURCES BOARD
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MONTANA WATER RESOURCES BOARD

Vol. 3, No. 1 NEWSLETTER Spring, 1970

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MAR
MONTANA LEGISLATIVE COUNCIL

North Central Montana's Economic Fate May Hang In Water Conservancy Decision

Water conservancy, passed by the 1969 Montana legislature, moved a step closed to reality in February as the Montana Water Resources Board received its first request for creation of a conservancy district.

The counties of Toole, Choteau, Liberty, Hill, Blaine, Phillips and Valley propose to construct an 80-mile canal to transport water from the Tiber Reservoirin to the Fresno Reservoir.

From there, the plan is to use the water to raise the level of the Marias and Milk Rivers. That would make possible the irrigation of another 72,000 acres in north central Montana.

More important than that, it would also accomodate a number of wildlife refuges at Lonesome Lake, Chain of Lake and others and an increased water flow to the present Bodouin refuge near Malta in Phillips County.

The creation of such a conservancy district would provide additional water for the municipal needs of many small Hi-Line towns.

It could also aid in creation of presently-scarce recreational sites.

Agencies such as the Soil Conservation Service and the Water Resources Board are interested in potential projects which might be included in the area.

But local support is needed. The Water Resources Board will have, by mid-July, a preliminary feasibility report on the proposal.

If the decision is made at that time to proceed with the project, local people throughout the district will need to have accurate information about the proposal, its aims and objectives.

To facilitate such information, the Water Board has scheduled a series of public meetings throughout the area as shown on page 3. The data pertinent to this proposal will be presented there and questions answered. All area sessions will be public and citizens from throughout the are urged to attend at least one of these meetings.

Havre Conservancy session

Montana Water Resources Board
NEWSLETTER

Published quarterly by the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601. Subscriptions free upon request.

MONTANA WATER RESOURCES BOARD

Governor Forrest H. Anderson
Chairman of the Board*
Douglas G. Smith
Director*
Wilbur White, Twodot
Vice Chairman and Secretary

Board Members
Homer C. Bailey, Corvallis
Fred Barrett, Chester
Clyde Hawks, St. Xavier
Everett Redeen, Forsyth

Newsletter Editor,
Kenneth D. Myers

Director's Report

Douglas G. Smith

This month brings about one of the most far-reaching events in the operation of the Montana Water Resources Board for some time.

The first week of April will see a series of public meetings throughout seven counties in north central Montana.

These seven counties have requested formation of a water conservancy district. They believe that multi-purpose development of their local water resources for irrigation, municipal water supply, recreation, and wildlife protection can serve as a catalyst for the kind of economic development this region so badly needs.

The key word in this conservancy proposal is "regional." This is the first time that water resource development has been able to cross county lines.

The other key word is "local." Without the support, indeed the leadership of the local people, this conservancy proposal will die a premature and needless death.

It is because we are concerned about the effects of apathy that we have slated this series of local meetings.

This is the time for the questions and suggestions. This is the time for the meeting of the minds.

The Montana Water Resources Board will give all the leadership it possible can. But the crux of the matter will be whether the local people care enough to see the project succeed.

I believe they do, and I believe with proper information they will.

If you are in the area please attend. The schedule will be listed in this issue.

We are encouraged by our feeling that Montana is beginning to awaken to the dangers of apathy. When the ten-year moratorium ends within this decade powerful south western states will seek our water. Only action — beneficial use — will save it. Working together the job can be done.

Guest Editorial

Mrs. Wes Woodgerd, Montana League of Women Voters, **Citizen Participation**

The League of Women Voters believes that proposed plans for Montana's water resources are of national as well as regional, state and local interest. For all interests to be best represented, agencies at all levels of government must be capable of participating fully in planning and management.

Better co-ordination and co-operation among state agencies now evident in Montana and the hope for effective executive reorganization should help counter-balance the past dominance of federal agencies.

The growing conflict between people who believe the only good water is stored water and those who believe the only good water is free-flowing will call for many value judgements in order to reach balanced decisions. These judgements should be made by the concerned citizens, not by technical experts, reflecting the biases of their agencies.

The League believes that citizen participation in policy decisions must be increased. The public should be involved from the beginning and more effective ways must be found for distributing information and encouraging participation by the general public. The presentation of a finished plan, in the standard format of public hearings, does not encourage involvement. Such hearings, too often, do not produce meaningful response from all segments of the public. The failure to supply clear, concise information and present alternatives prevents citizens from making valid choices in the complex problems of water resources.

Mrs., Douald Clusen, Vice-President of the League of Women Voters of the United States, in her statement to the National Water Commission said, "When the public is allowed only two choices about a plan — to accept or reject it — rejection by a disinterested public should be no surprise. We who urge citizen involvement have learned that you cannot treat people like children — deny them the significant facts in understandable form — and then complain that they lack awareness and do not exercise citizen responsibility."

Recent informational meetings on the proposed Water Conservancy District in six eastern Montana Counties are an encouraging sign that the Montana Water Resources Board recognizes the need for involvement of informed and concerned citizens. Efforts to involve representative citizens and non-governmental organizations in the development of the State Water Plan could help channel information to the public and build support for the needed legislation and appropriations.

The judgements necessary to reach a balance between the need for water projects and preserving the environment should be made by the citizens of Montana. They cannot make these choices without adequate information which clearly identifies the problems, assesses the needs and presents all the alternatives. Only through this involvement of informed citizens in the decision making process can Montana expect public support for the programs necessary to reach the goals for a state water plan.

Editorial Comment
What Price For The Export of Our Water?

Reprinted by permission of **RECCLAMATION** published by Canadian Water Resources Association.

What would the approximate cost of water delivered to the U. S. border be and will there be a market for it? Let us look at some rough figures based on an interest rate of 6 per cent.

If one divides the total annual cost of the NAWAPA project by the quantity of water to be diverted, one arrives at a figure approximately $50 per acre foot, or 15 cents per 1,000 U.S. Gallons. Studies done at the time of the Columbia Treaty indicate the cost of diverting water from the Fraser, Columbia and Kootenay rivers into the South Saskatchewan reservoir would be in order of $8 to $14. Routh calculations indicate the water diverted to the Great Lakes from the headwaters of the rivers flowing into James Bay might cost about $5 whilst water recycling from sea level might cost about $10.

To these must be added other costs, one for opportunity lost and one for profit. Here we might use a figure of from $2 to $5, which would seem reasonable.

If we put all these figures together we find the total price at which water might be sold to the United States at the border might vary from a minimum of $10 to as much as $60 per acre foot, or, in more familiar units, from 3 cents to 18 cents per 1,000 U.S. Gallons. Would the United States be interested in water at that price?

It is probable that, if Canada were to offer the United States water at a price that would be of reasonable benefit to Canada, the United States would not be interested at the present time.

However, if one looks farther into the future, there is one possible use of water for which the U. S. might be willing to pay a price that would make a continental water scheme attractive and justifiable. This surprisingly enough, is for irrigation. I say, "surprisingly" because many feel that farmers are unlikely to pay for irrigation water much more than the present price which ranges zero to about $10 per acre foot. Let me give some support for my argument.

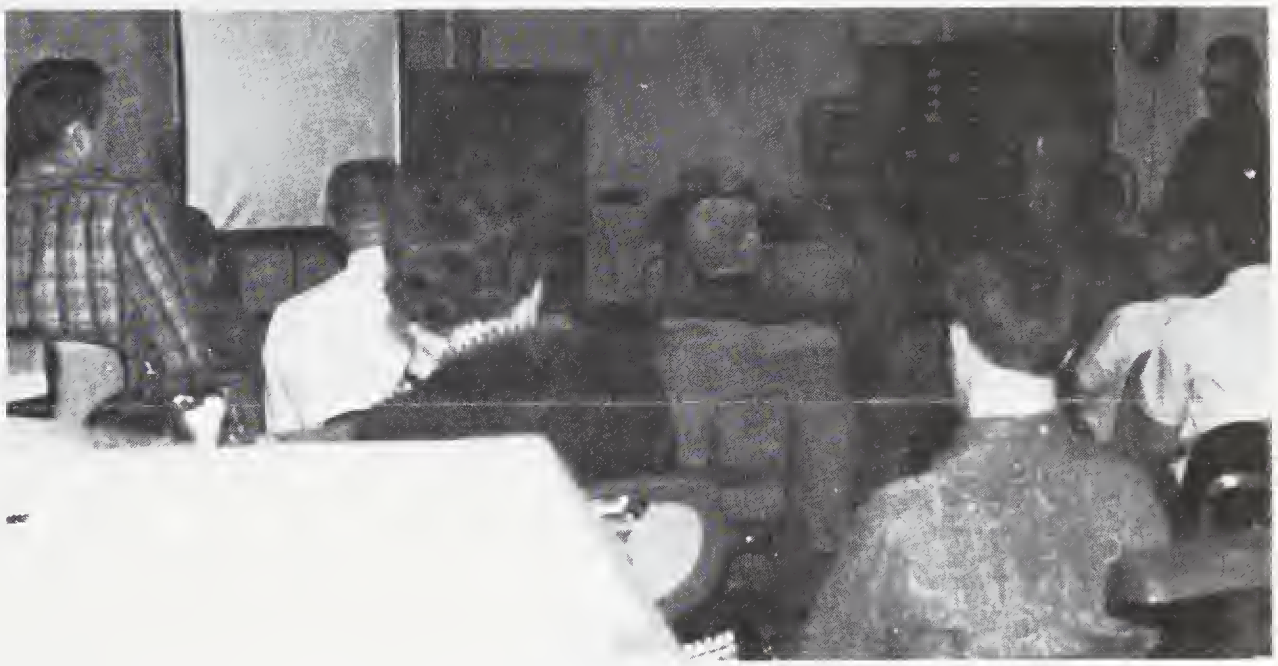
In tests of supplemental irrigation carried out in humid areas of United States, it was found that 3 to 10 inches of added water gave increases in value to crops per acre of from $7 to $400 at costs ranging from $40 to $160 per acre foot of water.

Professor Kuiper gives us a conservative example the irrigation of a low value crop such as wheat. The addition of 24 inches of water at $50 per acre foot would increase the cost of bread by only 5 cents per lb., or one tenth the cost of a package of cigarettes.

For whatever purpose water might be exported the revenue to Canada at the prices indicated would be substantial. Supposing, for example, there was, sometime around the end of the century an export of 50 million acre feet per year (one fifth the flow into James Bay) at $20 per acre foot, $10 of which was for opportunity lost and for profit. The total revenue would be one billion dollars half of which might return to the States as interest on capital investment and half, $500 million, would be a welcome assistance to Canada's balance of payments.

I would like to conclude by turning from the mercenary to the philosophical. It is almost certain that pollution control and the fees levied will result in considerable recycling of water so that industrial uses will become less lavish. There is therefore, no fear that the export of water will inhibit industrial growth in Canada. On the contrary, it is possible that a scheme to provide water to the States could also provide water for certain areas in Canada that are water devidient.

Finally, might it not be better to retain large areas of wilderness for the recreation of men's minds and bodies and leave the United States to expand its jungles of asphalt and smoke stacks if it so desires.



Water Resources Board employees attended a five week first aid course conducted by an officer on the Lewis and Clark County Sheriff's staff. The course was intended to make participants able to cope with any emergency that might arise. All Board employees also completed the Montana Safety Foundation's defensive driving course.

WATER CONSERVANCY
LOCAL MEETING SCHEDULE

MONDAY, MARCH 30 - - - - - - - CONRAD 1:30 P.M.
MONDAY, MARCH 30 - - - - - - - CUT BANK 2:30 P.M.
TUESDAY, MARCH 31 - - - - - - - SHELBY 1:30 P.M.
TUESDAY, MARCH 31 - - - - - - - CHESTER 7:30 P.M.
WEDNESDAY, APRIL 1 - - - - - - - BIG SANDY 1:30 P.M.
WEDNESDAY, APRIL 1 - - - - - - - HAVRE 7:30 P.M.
THURSDAY, APRIL 2 - - - - - - - - CHINOOK 1:30 P.M.
THURSDAY, APRIL 2 - - - - - - - - MALTA 7:30 P.M.
FRIDAY, APRIL 3 - - - - - - - - - GLASGOW 1:30 P.M.

ATTEND — PARTICIPATE

WATCH YOUR LOCAL PAPER
FOR THE MEETING LOCATION

WATER IN

Pollution Threatens

Agriculture

Industry

Construction

POLLUTION PHOTOS PROVIDED
BY DR. CLARENCE GORDON

THE WEST

. . . A Vital Natural Resource

Water For Recreation

The Montana Water Resources Board believes there is room for both environment and economic development in this state.

Great attention to enviroment is necessary to end the kinds of ecocatastrophe shown on the left hand page.

Economic development is necessary if the state is going to continue to provide the kinds of projects shown on this page — projects which bring a better life to Montana citizens.

We are committed to the proposition that with careful planning and citizen involvement we can have both.

Livestock Rangeland

Agricultural Production

EKALAKA EAGLE
Ekalaka, Montana

THE STORY
IN MONTANA

By Robert E. Miller, Secretary
Montana State Press Association

Housed in new quarters in Helena and with a largely new executive staff, the Montana Water Resources Board is aiming to project the state's water needs and availabilities to the years 1980, 2000 and 2020. Director Douglas G. Smith declares.

Smith, who took over as director in September, has been chiefly concerned with internal organization of the agency. John E. Acord, who is from Great Falls, last week became the board's new planning director. Robert R. Jensen, native of Joliet, assumed control of the administrative division in October. A J. Mancini, board geologist, heads the new water resources division, which will combine the former groundwater and surface divisions into one unit.

To complete the reorganization, the board's offices which were across town from the Capital, have now been moved to the Mitchell Bldg., within the Capitol complex, where better organization and integration with other governmental agencies is possible.

In addition, each division within the agency has been reorganized. Orrin A. Ferris, a native of Miles City, is the first professionally qualified engineer to be hired by the board in five years, Smith says. the engineering division has day-to-day responsiblity for the board's $14 million complex of some 180 projects throughout Montana.

This division will supervise construction of new projects and will be in charge of maintenance where needed.

Also, the engineering division will be responsible for a new aspect of the agency's activities when it branches into the field of recreation. Existing water storage projects will be made available for picnicking, water skiing and other summer pastimes.

Acord, who is familar with computer technology, will use his skill in that regard to develop a system for rapid retrieval of information obtained in interviews with farmers and others who use the board's services. His chemistry background will be useful when the agency moves into the field of water pollution prevention this year, according to Smith.

The water resources division plans a publication which will incorporate information gathered from interviews with farmers, testing of soils, plus other economic and historical information dealing with water on a county-by county basis.

"In our new activities," says Smith, we will try to involve every state and federal agency and every interested organization in the state in deciding just where the water conservation dollar can best be spent. We will confer with many people about where Montana should be in the field of natural resources to biuld a better state."

News

CURRENT NEWS BY AND ABOUT THE

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Basins Group Reports Appointments

Edward Dussault, the Montana representative to the Pacific Northwest River Basins Commission, announced Friday a series of appointments to committees of the group.

He said the new appointments were intended to give representatives of the educational community and the private sector greater voice in the development of water resources programs for the area.

Thomas G. Armour was appointed to the economics committee; Eugene Pike to the power committee; Claiborne Brinck to water supply; Dussault and Douglas Smith to policy; Dr. Ludvig Browman to aquatic plants and insect control; Orrin A. Ferris to hydrology and hydraulics; James T. Harrison Jr., and Dr. Arlen Super to meteorology.

GREAT FALLS TRIBUNE
Great Falls, Montana

Water Resources Board Eyes Grant

Tribune Capitol Bureau

HELENA — A proposal by the State Water Resources Board to apply for a federal grant to include information on water quality in the State Water Plan, has received the blessing of Montana's Water Pollution Control Council.

The first target would be the Musselshell River in central Montana.

The water board plans to seek a $200,000 to $250,000 grant from the Federal Water Pollution Control Administration. The funds would then be transferred to the state health department, which would hire staffers to collect the information.

Great Fa

Tuesday

Water Conservancy

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ONTANA WATER RESOURCES BOARD

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There are important irrigation as well as recreation possibilities in the project. The project also has wildlife management values and could provide a good municipal water system for Big Sandy.

Thorough studies will be made to determine the feasibility of the project.

Of great importance is the fact that voters in the seven counties in the proposed district will have the opportunity to decide if they want to participate.

It's encouraging that Montanans are thinking big about their water resources and are trying to take advantage of the 1969 Water Conservancy Act.

Montana has been lax in water conservancy programs. Neighboring states have been much more alert and aggressive about using their water resources.

Montana has been blessed with abundant water resources.

It's time the state awakened to the potential such resources provide.

Ravalli Republican

REVITALIZATION OF IRRIGATION SYSTEM

Proposed Daly Ditches Project Unveiled at Water Board's Meet

The Montana Water Resources Board this week unveiled plans for a ten-year $300,000 revitalization program for the Daly Ditches irrigation area in Ravalli County.

The announcement was made at the board's meeting in Helena this week.

Water board chief engineer Orrin A. Ferris said the work is needed on the extensive Daly Ditches system to replace timber structures, many of which are more than a quarter - century old and deteriorating rapidly.

The entire system irrigates about 16,000 acres on the Bitter Root Valley's east side from approximately Sleeping Child Creek to below Corvallis.

The two major ditches involved are the Republican and Hedge, which take their water from the Bitter Root River above Grantsdale. Smaller systems, most of which feed out of Skalkaho Creek, are the Skalkaho Hi-Line, Ward, Hughes, Gird Creek Hi-Line, Stud Barn, Snake Creek, Rim, Cow Creek and Reeser ditches.

The system is owned and supervised by the State water board, with individual users paying a fee for their water.

Ferris said cost of the project would be partially paid through engineering and technical assistance from the Bitter Root RCD project and Soil Conservation Service.

The other half of the cost will likely be met by an increase in water payments by local users. The users will meet later this spring to decide the issue, it was announced.

If the plan is approved, the state agency said some work could begin during the 1970 season.

The issue was presented at the final session of the water board's two-day February meeting. At an earlier portion of the meeting, the board heard its first request for creation of a water conservancy district, proposed for a seven county area in eastern Montana. The board also met with representatives of the Montana Water Development Assn., the Montana Water Congress, and the U. S. Army Corps of Engineers.

Board members, in addition to ex-officio members, Governor Forrest H. Anderson, and board director Douglas G. Smith, are Homer Bailey, Corvallis; Fred Barrett, Chester; Clyde Hawks, St. Xavier; Everett Redeen, Forsyth, and Wilbur White, Two Dot.

●

Water Rights May Be Kept On Micro Film

HELENA (AP) — Consensus of the members of Montana's Water Resources Board Friday is that a microfilm process would be of considerable help in keeping track of water right records throughout the state.

Records of water rights filed in county courthouses could be microfilmed by field agents with portable equipment.

The films would be sent to the Capitol for filing in a central location.

Discussion brought out that this system would eliminate the present possibility of errors in the present hand-copying of such records by investigators in the field.

Department officials will examine several proposals to provide the Water Resources Department with microfilming equipment.

Engineering Division

The engineering division provides services to local groups and water users associations to study, design, construct and assist in the maintenance of all state owned water projects.

The division provides detailed investigations of proposed projects.

Willow Creek reservior provides farmers and ranchers in the Harrison area with irrigation water.

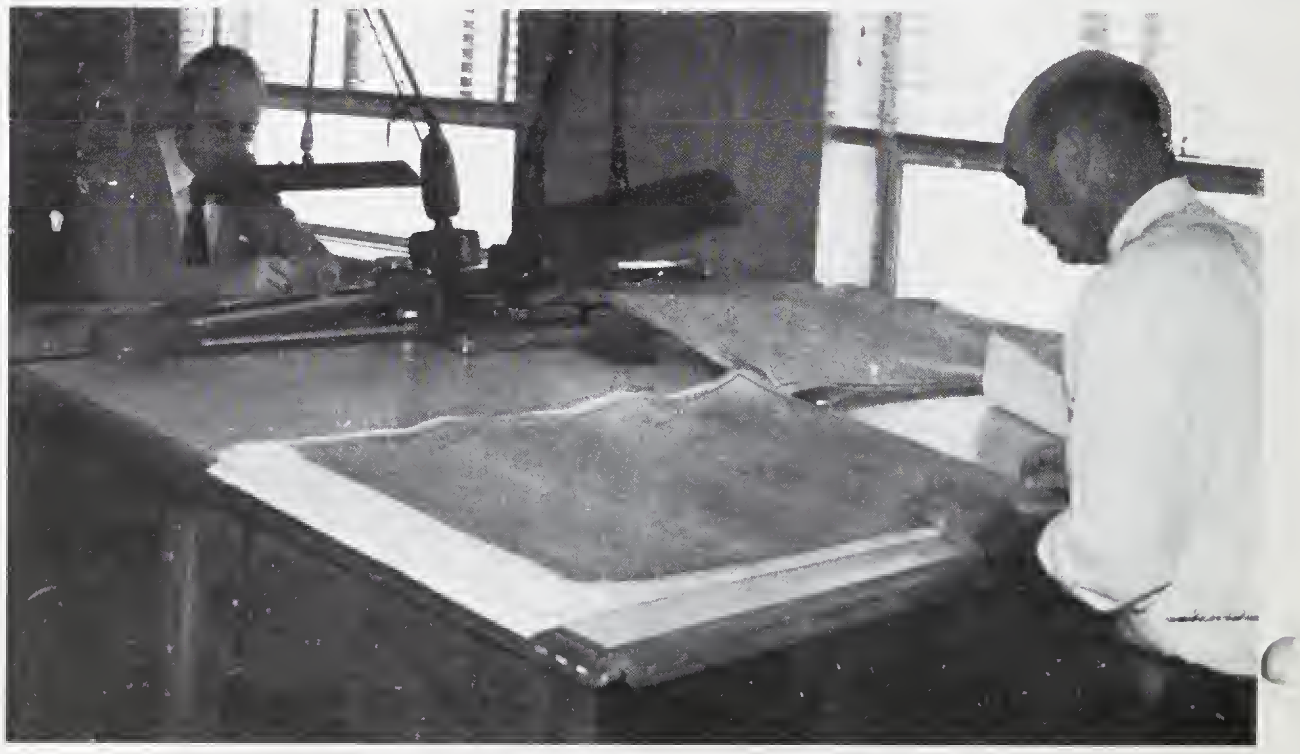
It provides detailed engineering drawings, contracts and construction supervision necessary to develop projects.

Water Board engineers cooperate with other state, federal and local agencies in development and construction of recreation facilities on Board proects.

The division measures streamflow data at 48 locations.

One important recent decision was the abandonment of the Board's former policy of charging all costs back to local water users for construction and maintenance.

Now, only extra costs such as per diem, gasoline, and other in-field expenses will be charged to the project.



One important engineering function is design and planning of new construction and maintenance on the Board's $14-million complex of projects.

Salaries, which would have been paid by the Board anyway, will no longer be included.

The engineering division will also be increasingly concerned with the state's water conservancy activities and with several SCS Resource Conservation and Development proposals.

Water Resources Division

The water resources division was formed by combining the former surface and groundwater departments.

This division administers the groundwater code. Some of these decisions involve possible controlled groundwater areas such as now exist near Baker.

In addition, some surface water responsibilities once carried out by the State Engineer's office have fallen to this division. These include making investigations to secure information and initiating actions to secure and maintain the rights of water users throughout the state.

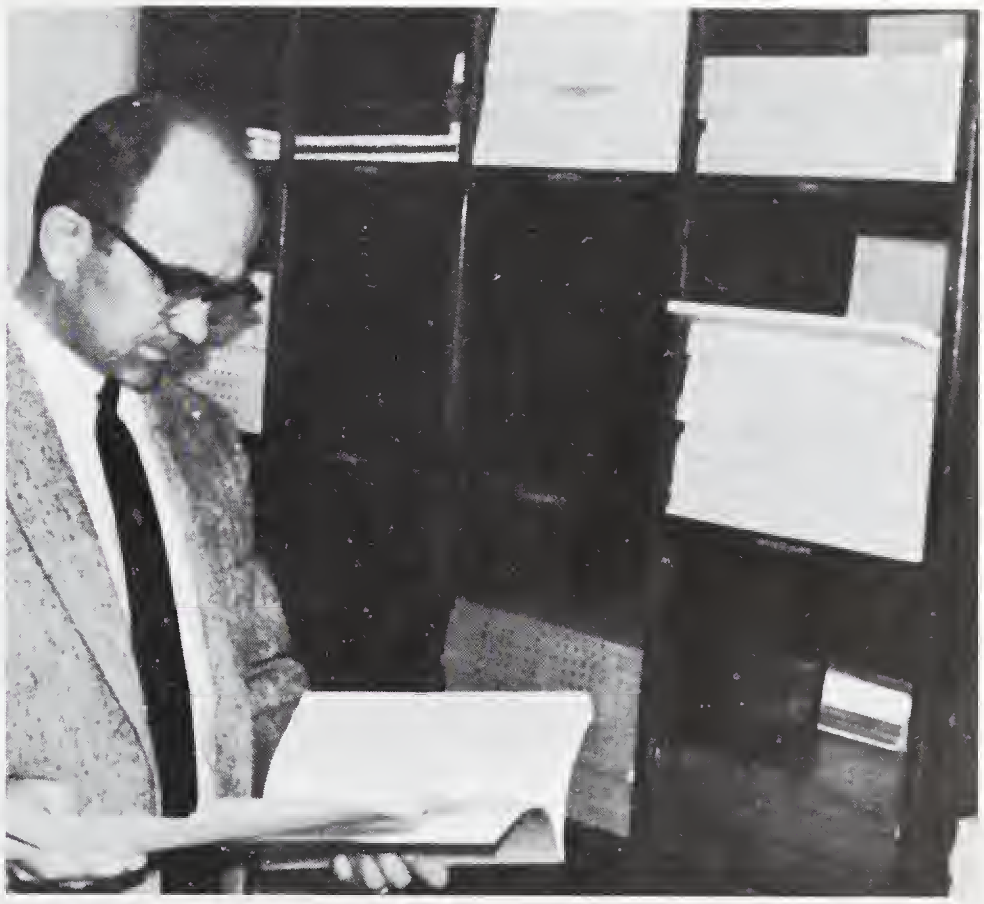
The division has conducted a county-by-county water resource survey and has published comprehensive studies of the counties surveyed to date.

The division is now undertaking a program aimed at microfilming all records of water appropriations persently stored in each county courthouse. The purpose is to have a central storage and rapid retrieval system.

Other division assignments include dealing with well drillers, working with matters relating to coal and water and the environment in general.

The water resource survey publication information is gathered by personal inviews with farmers and ranchers in each county of the state.

Groundwater supervisor Ron Guse points out one of the thousands of individual water appriorіation forms on file in the Board's offices. In the background is a map showing the Board's groundwater control area near Baker in the South Pines region.



Water Resources Division Director A. J. Mancini receives many queries about water availability throughout the state. Many of these questions are answered through the Board's water resource survey reports published for 46 of Montana's counties.

Planning Division

The Planning Division has the prime responsibility for developing a comprehensive state water plan which "shall set out a progressive program for the conservation, development and utilization of the state's water resources, propose the most effective means by which these water resourcs may be applied for the benefit of the people, with due consideration of alternative uses and combinations of use."

The state water and related land resources plan is being developed in phases that form a framework for this plan:

1. The inventory phase, to accumulate detailed knowledge of the resource and present management and use of it. Involved in this phase is computerizing of all raw data in a storage and retrieval system, known as the Montana Water Resources Data Center, which will allow easy and rapid use of our water information in many ways, including current and subsequent phases of the water plan.

Montana's inclusion in a current Type IV study of the Big Horn, Clarks Fork and Stillwater River areas will enable use of the information gathered by the Soil Conservation Service in the Montana state water plan.

II. A water requirements and projection phase which, when balanced against the inventory, will allow the Board to estimate surpluses and deficiencies and to project and recommend developments in the future at 1980, 2000 and 2020.

III. The implementation phase, which is being developed from the first two phases and will continue to expand with them.

Early results of the plan should indicate a clear definition of the most urgent problems of water resources development and provide an accurage knowledge of the resource and its relative significance with regard to other resources of the state. The plan will further provide a definitive framework that will allow development of both short and long-term recommendations for optional development and management of Montana's water resources.

Phase I of the state water plan is now being implemented, with particular emphasis on the data storage and retrieval system. Phase II is just getting underway.

Members of the planning division's soils survey department define exact acreages for use in state water planning.

Administrative Division

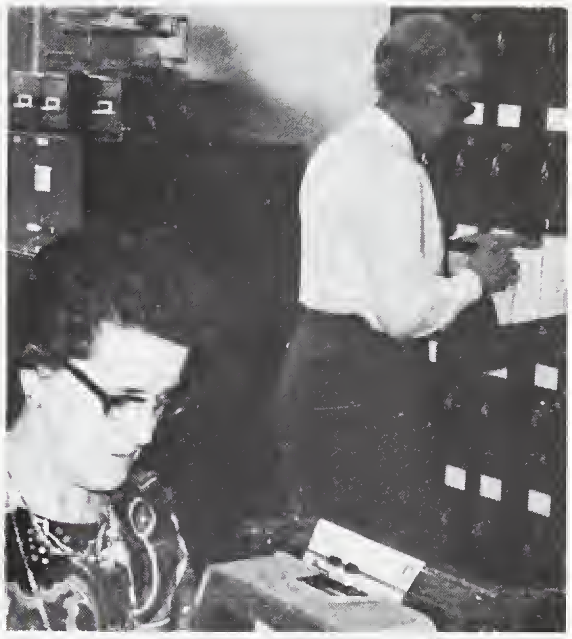
The administrative division is concerned with the management area of the Water Resources Board.

Headed by personnel director Robert R. Jensen, this division has undertaken complete job descriptions and specifications for all 65 positions on the staff.

Jensen has also developed personnel data forms, a current organization chart and will begin job pricing this spring.

Also in this division are the public information activities of the Board as well as accounting and general services. The accounting division has worked toward enabling all bookkeeping procedures to be put on computer. This department is also responsible for the fiscal operations of each Board project throughout the state.

Robert R. Jensen and William Dykman, chief accountant, confer daily in their management of the administrative division.



Keeping accurate and up-to-date information about water fees and payments on all Water Board projects is an important part of the accounting department's duties.

First aid course students here adjust a makeshift splint on one of their "injured" co-workers.

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News Notes

ACORD NAMED NEW PLANNING DIRECTOR

John E. Acord, former Custer County Agricultural Stabilization Committee office manager, is the new Water Board Planning director.

Acord's background in chemistry will be useful in that poisition as the Water Resources Board assumes a more aggressive stance toward water pollution.

John Acord

His experience in computer technology will be helpful in the planning division's efforts to computerize all information from the state water plan.

As planning director Acord will be responsible for completion of the state water plan; due in 1972. This projection will show the state's water availabilities and needs for the years 1980, 2000 and 2020.

Acord is married and has four children. He is a Great Falls native with a BS degree from the College of Great Falls. He has also worked toward a PhD degree.

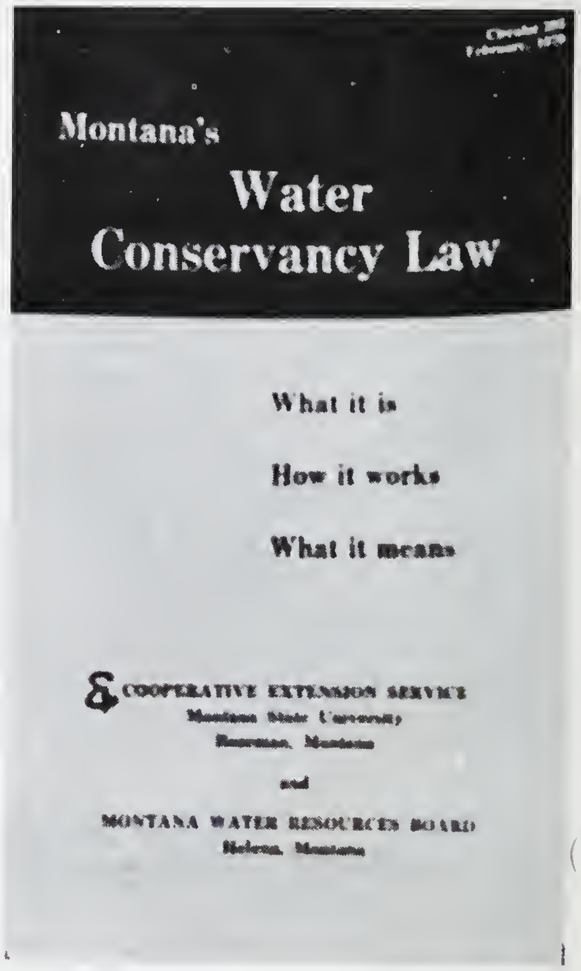
Former Chester mayor William Hunt is the new director of the Montana Aeronautics Commission. He succeeds Charles Lynch who is recuperating from an air accident.

Water Board Director Douglas G. Smith is the new chairman of the Western States Water Council's Water Resources Committee. The Council is a creation of the Western Governor's Conference which is made up of the chief executives of 13 western states.

Former Montana Congressman Wesley D'Ewart was presented the Uupper Missouri Water Users Association's Distinguished Service Award at ceremonies in Huron, S. D. The presentation was made in recognition of his outstanding contribution in the field of water conservation and development.

Water Board district engineer, Elbert N. Cooper, Sr., retired in February after 32 years with the Board.

Former Montana Farmers Union official J. T. Ryan is now a manpower development specialist with the State Dept. of Public Instruction.



Montana's
Water
Conservancy Law

What it is

How it works

What it means

COOPERATIVE EXTENSION SERVICE
Montana State University
Bozeman, Montana

and

MONTANA WATER RESOURCES BOARD
Helena, Montana

A concise explanation of the new water conservancy law is now available through the offices of Montana's Water Resources Board or local county extension agents throughout the state. There is no charge for this publication.

Montana Water Resources Board
Mitchell Building
Helena, Montana 59601

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THURBER'S

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MONTANA WATER RESOURCES BOARD

Volume 3, Number 2 NEWSLETTER Summer, 1970

STATE DOCUMENTS
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Montana Water Conservancy Activity Increases

Third Request Now Before Board

Montana's new water conservancy legislation has found wider interest than anticipated. Sponsors of the legislation, basing their judgment on similiar experience in North Dakota, had guessed it would be at least five years before the state faced a conservancy district formation request.

At last count there were three such requests, covering 19 of Montana's 56 counties, a total of 56,859 square miles.

FIRST REQUEST EQUALS FOUR STATES

The first area to request a preliminary feasibility study was the north central region of Montana; nine counties including Glacier, Pondera, Toole, Liberty, Hill, Choteau, Blaine, Phillips and Valley.

This proposed district covers an area of some 29,636 sq. mi., the size of the states of Vermont, New Hampshire, Massachusetts, Rhode Island and half of Connecticut.

SECOND DISTRICT EYES INDUSTRIAL, MUNICIPAL NEEDS

The second water conservancy district covers the counties of Garfield, McCone, Dawson and Richland, lying in the east central area. Vast coal deposits lie in the area, largely untouched because of the need for readily available water supplies.

In addition, the cities of Circle and Jordan now experience some water shortage as well as a severe need for higher water quality.

Named to head the preliminary feasibility study into this area was the Bozeman consulting economics firm of T.A.P., Inc. The firm has already begun to study the soils, economics and water needs of the region.

MISSOURI HEADWATERS CAME NEXT

Following a meeting sponsored by the Townsend Chamber of Commerce and a later session with county commissioners in Whitehall, a request was accepted for a third water conservancy district feasibility study.

Probable boundaries of this district are the counties of Beaverhead, Madison, Jefferson, Gallatin, Broadwater and part of Silver Bow, 15,276 square miles.

The next step in this study depends upon obtaining an emergency appropriation on the first day of the next legislature. Until then only preliminary planning can be accomplished because the Board has no funds.

BIG JOB—NO FUNDS

The problem arose because the 1969 legislature, which passed the water conservancy act, required the Montana Water Resources Board to conduct preliminary and secondary feasibility studies into conservancy district formation when requested. It did not, however, provide funds for these time consuming and costly studies, anticipating little such activity until later legislative sessions.

Continued on Page 3

Water in summer — Deadman's Basin

Montana Water Resources Board
NEWSLETTER

Published quarterly by the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601. Subscriptions free upon request.

MONTANA WATER RESOURCES BOARD

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Director*

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Newsletter Editor,
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MONTANA PRESS ASSOCIATION 70

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Director's Report

Douglas G. Smith
Director

Before another edition of the NEWSLETTER appears, I will have been director of the Montana Water Resources Board for one year. This might be an appropriate time to review the steps we have taken both internally and externally to bring better management to this agency.

Internally we began with staff. Starting with our personnel director Robert Jensen, going through our planning director, John Acord and the Board's first professionally qualified chief engineer in five years, Orrin Ferris, we attempted to bring professional competence to the Board.

Next we moved into the area of job descriptions. We are now reasonably certain that each of our 65 employees knows who he reports to, what his duties are and how he is expected to perform them.

Job pricing is another important step. Unless state government is prepared to compete for talented, qualified personnel, you must settle for public employees of occasional talent but more frequent mediocrity. In our Board, we have tried to bring about equitable pay for duties performed as well as similar pay for similar duties within various parts of the operation. The result has been an improved morale picture, greater efficiency and diligence in job performance.

We are now concluding a series of policy statements that make clear to each employee the Board's position on matters of sick leave, vacation time, job performance which had previously been left to individual judgment with no sense of direction from the Board.

We are now moving into the area of job performance evaluation. This is an exceedingly difficult part of management; sitting down with each employee to attempt to improve performance. But the results of that kind of evaluation can be greatly increased efficiency and economy. And we are comitted to a dollar's value returned for every tax dollar spent in running the Water Resources Board.

The results of our efforts are gratifying. Various other state agencies including the Governor's office have asked the services of our personnel director in setting up their own job description, organization charts, chain of command and similar management functions.

Externally, we have operated under a sense of urgency. Montana has only until 1978 before the moratorium on inter-basin transfers of water expires. At that time powerful southwestern states will certainly demand our water for their own use unless we can show that we have used it beneficially here in the state.

One method of beneficial use is the water conservancy district legislation. We believe this legislation is one of the most important single acts of Montana's legislative history. We now hav three water conservancy district requests and more will no doubt arise. The law, though imperfect, provides an excellent place to focus our activity in a full-scale water plan which is so badly needed throughout the state.

I have also worked on various regional groups; the Western States Water Council with Senator Bill Groff and the Pacific Northwest River Basins Commission with former Senator Edward Dussault, to name just two. Both of these are intensely concerned with protecting water in the West.

After nearly one year on the job, I think it is a safe assessment to say Montana's interest in water development has been reawakened. This is due to searching and intelligent coverage by the news media, dedicated activity by farsighted legislators, strong support and interest by the private water development associations and other citizens and organizations, the growing national awareness of the importance of plentiful supplies of pure water and the new sense of inter-agency cooperation in state government brought about by the Anderson Administration.

The Montana Water Resources Board, and I particularly, owe a great debt of gratitude to all those persons for their advise and counsel these past months. We all look forward to working very closely with the citizens of this state as we work together to keep Montana water for Montana people.

GUEST EDITORIAL

by

State Senator

Gordon McGowan

Editor's Note: Senator Gordon McGowan introduced and fought successfully for the passage of Senate Bill No. 67, the Montana Water Conservancy Law. He also serves as chairman of the Senate Water Committee. Because of Senator McGowan's long leadership in the field of natural resource development and the growing interest in this field, the Montana Water Resoures Board asked Senator McGowan to serve as Guest Editor for this issue.

MONTANA WATER—A LOOK TO THE FUTURE

Montana now has its greatest historical opportunity to make beneficial use of its water. The passage last session of the Water Conservancy Law has provided this state with the vehicle to make multiple use of water in a businesslike, full-scale manner with strong local control. Few pieces of legislation have been so thoroughly researched by so many well qualified persons at all levels as this legislation.

Certainly, the rapid growth of interest in water conservancy districts indicates the widespread concern among all Montana citizens about the need for such development.

North Dakota had its water conservancy law on the books for ten years before a district was formed. We have had the Montana law only a year and already three formation requests have arisen and others are no doubt in the mill.

Water conservancy legislation is a proven success in many other states. Ohio adopted such legislation in 1914, Oklahoma in 1923, North Dakota in 1955. Montana is in fact the last of the western states to see the need for such a project.

It is important because it permits local people who want to get things done the bonding power to accomplish their objectives. It also makes it possible for those who benefit from the project to pay as well as for regional participation in projects which benefit the entire area. It allows rural and urban people to work together constructively.

But most important, it allows local people to control their own future. I have always belived that local people know best their needs and potential. Water conservancy legislation was very carefully drafted to maintain and promote this local know-how throughout the organization and operation of each individual district.

By the end of this century there will be some three hundred million people. That means that our nation's water simply will not be wasted and unused eternally. It will be put to use, of necessity, whether it is here or elsewhere.

Those of us who are committed to making Montana the kind of state our children can remain and raise their families in believe it behooves us to see to it that water goes to work for Montana.

If we can show that we are using the abundant supplies of water here in a beneficial manner, then we will be able to make a good case for keeping the water. Today, we export some 40 million acre feet each year. One acre foot supplies a family of five for a year. That means we export right now enough water for 200 million people each year. That's why there is such keen downstream interest in laying claim to our water supplies.

The importance of this kind of full-scale planning cannot be overemphasized. We now live under a ten year moratorium which will expire in 1978. Until that time, no inter-basin transfer of water will be allowed. But it seems clear to me that Montana, with two Congressmen, cannot hope to stem the tide of demand for our state's unused water which will be voiced by the numerous Congressmen from southwestern states. Certainly a joint effort by several of these states to conduct a raid on Montana water would find us in a virtually defenseless situation.

If we are to gain the kinds of federal funding I believe will be needed for any meaningful water development, every Montana citizen will have to exert his own influence in that direction. There will be no time for partisan politics or special interest protection in that fight. As the American international involvement recedes, a multitude of demands for money for urban development, space, health needs and education goals overshadow the needs for natural resources development unless we all work together.

The key to all of this is sound, multiple use planning and complete cooperation among individuals, organizations and agencies. If the kind of long range planning and cooperation which brought our water conservancy law into existence can continue, Montana can grow and prosper in this important decade which lies ahead.

Conservancy Activity

Continued From Page 1

Activity came almost immediately, however, and the Water Resources Board proceeded with payment for the first two feasibility studies out of funds already appropriated for contractual services. Those fund are exhauted and no monies are now available for the third study.

Water Board director, Douglas G. Smith intends to push forward with conservancy activity.

"The legislation charged us with coordinating these districts and the needed studies and we will continue to do so if we can obtain funding. We believe conservancy districts offer an important tool in Montana's long overdue water development and we intend to maintain our pace in that activity."

In the meantime, the clock is running on the six months deadline for the first two studies and plans are well underway for the third as Montana's water conservancy law gets its first on-the-job scrutiny.

R. J. Guse New Board Water Resources Director

Ronald J. Guse was named July 28 to the position of water resources division director for the Water Resources Board, a position he has held on an acting basis since the resignation of A. J. Mancini.

The new division director, 25, is married and has one daughter. His division is concerned with surface and groundwater and encompasses the Board's field survey crews.

Preliminary Feasibility Survey

First Step in Conservancy Planning

WHAT IT IS

The preliminary feasiblity survey is designed to be an initial look into whether a particular proposed water conservancy district can or should be formed.

Since the purpose of a water conservancy district is to prevent and control floods, erosion and sedimentation, provide for stream-flow regulation, improve drainage and reclaim wet or overflowed land, promote recreation, provide benefits for irrigation, recreation and wildlife and provide industrial, domestic, municipal and livestock water supply, the feasibility study is expected to say, in a preliminary manner, whether these objectives can be accomplished by the conservancy district as proposed.

WHO MAKES THE STUDY?

The practice of the Montana Water Resources Board has been to retain private consulting firms to compile the preliminary feasibility studies. These firms have technical and professional personnel it would be impossible to duplicate within the Board's staff for a short-term study. For the first conservancy study, the Board selected the Helena consulting engineering firm of Henningson, Durham and Richardson, Inc. The Bozeman consulting economics firm of T.A.P., Inc., was named to the second study. No decision has yet been reached on the firm for the third, Missouri Headwaters, feasibility survey.

One of the most important steps in beginning any preliminary feasibility survey is the selection of a consulting firm.

The Water Resources Board considers the firm's background and experience, professional qualifications, ability to meet the time limit and general reputation. A number of firms have appeared before the Board during each of the three proposed studies and each was given thorough and sincere consideration.

Here the contract is being signed for the first conservancy district between Robert Rohling, vice president of Henningson, Durham and Richardson, Inc., Wilbur White, vice chairman of the Board and Director Douglas G. Smith.

HOW LONG DOES IT TAKE?

By statute, the preliminary feasibility survey is required to be completed within six months after the request for the study is received by the Water Resources Board.

WHO PAYS FOR THE STUDY?

The first two preliminary feasibility surveys were paid from contractual services funds already appropriated to the Montana Water Resources Board.

Although these funds are now exhausted, the Water Board will seek an emergency appropriation early in the next session to begin work on the third conservancy study.

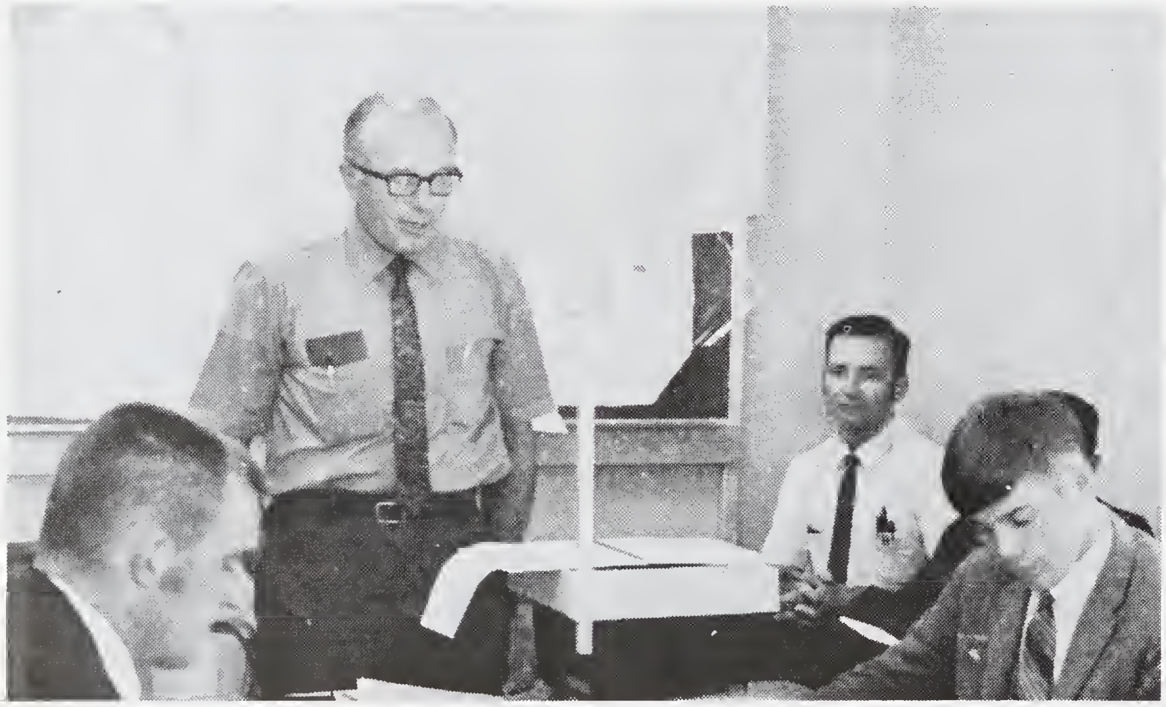
HOW DOES THE CONSULTING FIRM CONDUCT THE STUDY?

After the firm is selected it begins with meetings with all state and federal agencies which have already made studies in the proposed conservancy area. This information might include soils studies, water use studies, population figures, economic data, agricultural information and other previously recorded material.

This secondary information becomes the basis for the study. The firm then sends its own teams into the area to meet with county officials, legislators, civic organizations, water users groups and interested citizens to find local recommendations for potential projects, water development needs and similar suggestions.

The firm then makes its own evaluation of the information, trying to depict what the economic situation might be if no development were to take

Continued on Page 5



In order to keep current about progress of each of the preliminary surveys, the Montana Water Resources Board requires monthly status reports from each of its consulting firms.

Mr. William Ewasiuk and Dr. Earl Skogley of the economics firm of TAP, Inc., explain progress in their east central conservancy study. At extreme left and right are chief engineer Orrin Ferris and Robert Clark of the Water Resources Board.

Feasibility Study

Continued From Page 4

place as well as what economic benefits might accrue to the area from complete development.

The firm will then meet with local residents in the conservancy district area to present its studies to-date and receive additional suggestions and comments which might arise.

Finally, the firm will present to the Board its complete preliminary feasibility survey. This study is required by law to contain the proposed boundaries of the district, the purposes of the district and the projects contemplated.

WHO OVERSEES THE STUDY?

All preliminary feasibility surveys are very carefully monitored by the staff of the Montana Water Resources Board. The Board requires monthly written and oral progress reports from each consulting firm. The Board also keeps in constant contact with the work as it progresses, offering comments and suggestions throughout the progress of the plan.

In addition, through a number of local meetings the public is constantly involved. The Board feels very strongly that this must be the people's plan for full-scale water development. Monthly news reports are sent to all newspapers and radio stations throughout the conservancy areas in order to keep local people in close contact with each month's development.

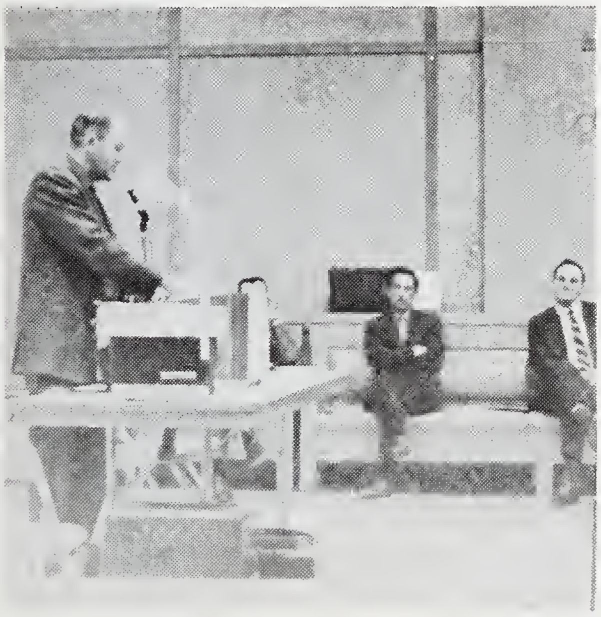
DO THE LOCAL PEOPLE HAVE TO ACCEPT THE STUDY?

In each and every case, the decision about formation of the water conservancy district is strictly up to the local people. If local support is lacking and the feeling is tthat no secondary feasibility study should be undertaken, none will be. And, after both studies are made, if fewer than 51 per cent of the eligible voters go to the polls or if a majority of those 51 per cent fail to vote for district formation, no district will be formed.

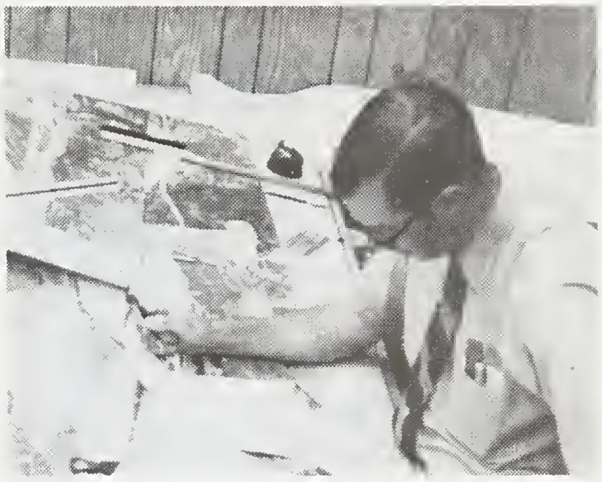
WHY IS A WATER CONSERVANCY DISTRICT IMPORTANT?

Water conservancy districts offer full-scale water development to a widespread area. What Montana has always needed is the kind of master-plan development which could cross county boundaries. A conservancy district can do that. It has the power of eminent domain, it can create bonded indebtedness but yet it is always controlled by the local people. With all these facets, water conservany could be one of the most important natural resource development tools in Montana history.

BELOW: Chairman Dean McFadden of the Hill County Commissioners addresses a capacity crowd in the Havre Elks Club during the Board's tour of the conservancy district area.



ABOVE: Bureau of Reclamation representative Mike Drazich also traveled on the north central conservancy tour. He explained his agency's proposed diversion canal from Tiber to Fresno Reservoir.



ABOVE: Staff members of HDR study detailed data gathered by the firm in a series of visits with state, federal and local officials. All such past information will be re-evaluated and included in the feasibility study report.

ABOVE: Chief engineer Orrin Ferris and HDR's Milton Smith keep in constant contact throughout the planning and preparation of the report. The Board wants to make certain that all possible projects are included in the evaluation.

ABOVE: HDR's Helena supervisor Milton Smith points out one of the soil maps which are being studied in the north central conservancy area. Soils information is analyzed to study the feasibility of specific areas for certain kinds of projects and structures as well as specific needs of water development throughout the district.

IS MORE INFORMATION AVAILABLE?

The Montana Water Resources Board, in cooperation with the State Extension Service, has prepared an informative booklet describing the organization of a water conservancy district under the law. These booklets are available through local county extension agents' offices or by writing the offices of the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601.

INDEPENDENT RECORD

Board Plans Tour of Water District

The Montana Water Resources Board and a Helena consulting engineering firm will make a second tour of the state's first proposed a water conservancy district next week.

The district, which includes the counties of Pondera and Valley, has been under a preliminary feasibility study for several months.

Douglas G. Smith, water board director, said the purpose of the tour is to meet with local officials and others to review progress on the study and to develop suggestions for additional material.

He said the tour would be divided into two teams, both beginning Monday.

SIDNEY HERALD

Report Underway

The Bozeman consulting economics firm of T.A.P., Inc. told the Montana Water Resources Board last week it is well underway with the east central Montana water conservancy district feasibility report.

The firm submits montly progress reports on its activities to the Water Board. So far the group has compiled an exhaustive study of human and natural resources available in the area. The report was compiled through extensive investigation of secondary materials available from othr state and federal agencies. The next step in this task will be to project what trends might be expected in the area if no water development were to take place.

T.A.P. has also gathered detailed information concerning soils in the four county study area as well as a topographical map to determine drainages which might have potentially irrigable areas.

The firm has also retained the legal services of Helena attorney Henry Loble and Helena engineers Morrison and Maierle, Inc. to assist in other phases of the study.

TOWNSEND STAR

From Where I Sit . . .

by John N. Jepson

The annual Chamber of Commerce meeting and dinner promises to be one of the more informative programs that we have seen at the annual event for some time. The Conservancy District law will be explained by Doug Smith, the state official who is responsible for its implementation. Mr. Smith is the director of the Montana Water Resources Bd.

In a few short years Montana has witnessed a movement develop that has seriously hampered the reclamation program as Montana has known it in the past years. The environment issues that have become so prominent have included most things that cause anything to be changed from its original status. This has seriously questioned the storage of water for irrigation and/or other purposes. In addition, the federal budget has been stretched to the point that monies have not been available for reclamation. We can also expect to see more emphasis put on urban needs and therefore a greater share of the federal budget going to urban areas.

With some of these thoughts in mind, it might be well to hesitate a minute and apply some of these circumstances to our area. We can rest assured that projects such as Reichle will not become easier to develop, and chances are that they will become even harder to get underway.

The Conservancy District law could be of some assistance in the development of such projects, and has many other benefits related to water planning. Doug Smith has described the new law as a tool to give guidance and direction to the orderly development and use of water in Montana. The state could certainly benefit from something that will better guide and speak for a water development policy.

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News

CURRENT NEWS BY AND ABOUT

Claim

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is an important one for Mont

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bit hard to understand.

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Water

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Montana Water Resour
Board staff members will be
Circle and Jordan, June 22,
to explain their agnecy's ro
the proposed water conserva
district for the area.

Water Board Director,
las G. Smith, said his staff
be accompanied by a numb
state and federal agency re
sentatives also involve
conservancy plans.

Smith said the Monday
22, meeting in Circle will
the High School auditorium
the Tuesday, June 23, mee
in Jordan in the VFW hall.
sessions will begin at 7:30

digest

MONTANA WATER RESOURCES BOARD

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There are proposals to take this as-of-now-superfluous water from the source and ship it south to water hungry states of the Southwest. If put into effect it is possible these proposals could damage the fishing streams of Montana.

The key is the so-called unused waters. What would happen to Yellowstone or Madison fishing if the flow was decreased because the water was being taken elsewhere? Yet some of this water is classed as unused. It is used. It is just not consumed.

Montana needs an assertion that it needs that water for recreation. Or else it may find its "unused" waters diverted to arid states and its tourist industry drying up.

N TRIBUNE

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Smith said the public meetings were intended to serve as a two-way forum for the state and federal agencies to explain the organization and operation of water conservancy districts and for the local residents to ask questions and give their opinions about the proposal.

CIRCLE BANNER

Water survey underway

A Montana Water Resources Board survey crew has moved into McCone County according to Douglas G. Smith, board director.

Field supervisor Ned Johnson has established field headquarters in the Travelers Motel. His ten-man crew will travel throughout the county to interview each farmer and rancher about present and potential irrigation.

Last winter, board personnel worked at the Courthouse to compile records of water rights, appropriations and decrees.

Federal and state agencies will also be contacted for information on their activities in the field of water resources.

Johnson said all reservoirs with a capacity of 50 acre feet or more would be located and noted in the Board's survey report of McCone County.

The final information will be used as part of the state water plan. The plan, due for completion late in 1972, will attempt to project Montana's water availabilities and needs for the years 1980, 2000 and 2020.

The information will also be published in book form and made available as research resource material. Included in the publication will be water rights and uses, historical data and soils information.

The McCone County survey was hastened because of the area's inclusion in a potential water conservancy district. The information gathered by the survey crew will be of considerable assistance in compiling a preliminary feasibility report into formation of a regional conservancy district for the counties of McCone, Garfield, Dawson and Richland.

The McCone Survey is expected to take about six weeks.

DAILY INTER LAKE

Lincoln Area Study Approved

HELENA (AP) — The Montana Water Resources Board said today it has received final approval from the U.S. Geological Survey to begin a groundwater study in the Lincoln area.

A groundwater study of the upper Blackfoot and Alice Creek drainage areas was one of the items discussed at last week's Montana Land Board meeting in Helena. The board deferred action until Wednesday on a request for easements on 680 acres of state-owned land in the Heddelston area of Lincoln by the Anaconda Co.

Douglas Smith, Water Board director, said the study will include geologic mapping of the area.

He said from the data gathered in the testing, accurate predictions can be made about mining effects on the environment.

The study will begin July 1, Smith said, and will cost about $35,000. He said the board will fund one-half the cost and the other half will be met by the USGS.

LIVINGSTON ENTERPRISE

Irrigation project

HELENA (AP) — The Montana Water Resources Board has called for bids on pumping systems and other works on the Sidney Irrigation Project, estimated to cost between $275,000 and $460,000.

Douglas G. Smith, board director, said the project is located about four miles southeast of Sidney and includes irrigation canals, laterals and two complete pump systems.

Bids will be opened June 26, he said, with the dirt works to be completed within 250 days and the pumping installations 700 days after the contractor receives final approval of the bid.

Council On Natural Resources and Development

A Case of Cooperation

One of the prime complaints about state government, by both insiders and the general public, is the lack of interagency cooperation.

One state group is doing something about it; the Governor's Council on Natural Resources and Development.

The Council is a statuatory agency, composed of 16 resource-related state agencies. Permanent chairman is Douglas G. Smith. Lewis M. Chittim, state highway engineer, is secretary. Prominent Helena businessman and former state legislator George McGaffick is full-time Council coorindator.

The Council serves as a forum for discussion of resource and development problems. Its semi-monthly sessions see a series of proposals, disucssion and studies by council members, other state and federal agencies and the general public.

Since Smith has been chairman, greater efforts have been made to involve citizen groups and interested individuals in the actions of the Council. The Council has also taken more active stands on resource-related matters.

Early this year the Council heard a thoughtful and persuasive discussion of the State Soil Committee's rangeland resource plan. The Council unanimously endorsed the proposal. Governor Forrest H. Anderson, acting perhaps partly on the basis of his Council's recommendation, also endorsed the plan.

Spokesman Peter Jackson told the group that proper utilization of the state's rangeland would return thousands of acreas and millions of dollars to the Montana economy.

First Lady of Montana, Mrs. Forrest H. Anderson, places a Ponderosa Pine, state tree of Montana, in its capitol grounds location during an Arbor Day ceremony.

Mrs. Anderson is visiting each of Montana's various institutions this summer in her drive to improve the landscape and environment of the sites. She is aided in planning such improvements by Council landscape architect Richard Mayer. Helping with the pine is Art Gruenhagen of the State Forester's office, which provided the tree.

State Sen. Harry B. Mitchell of Great Falls appeared before the Council to urge adoption recreation as a beneficial use of water. Mitchell said such a declaration by the legislature would give Montana greater bargaining pewer in efforts to save water from downstream states.

Landscape Architect Richard Mayer tells the Council of his plans to improve the appearance of various projects around the state including the capitol complex.

BELOW: Former State Sen. Charles Mahoney led a McCone County delegation seeking paving of the Hells Creek Park road in eastern Montana. At right is State Sen Dave Manning, District 6, which includes the Park area.

Board Personnel, Officials See 29 Projects On Two-Day Tour

Board members, staff personnel and press representatives flew over some $16 million worth of projects constructed by the Montana Water Resources Board during a two-day tour June 30-July1.

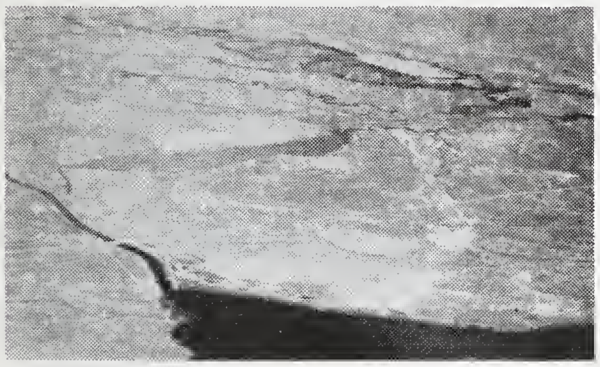
Twenty persons took the 2,000 mile trip through all areas of the state. Four planes were chartered for the event.

Main purpose of the tour was to acquaint Board personnel with the location and purpose of its projects.

The group also saw the condition of projects after the heavy spring runoff and the rapidly increasing recreational use on its facilities.

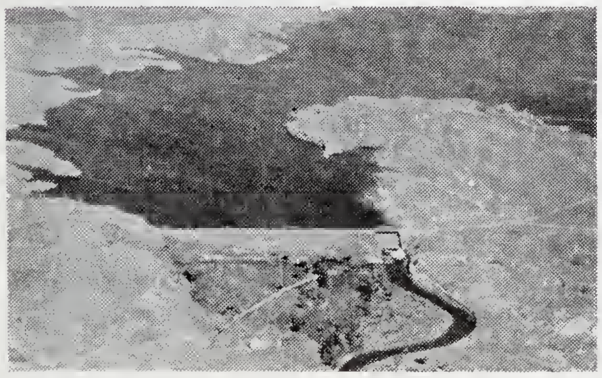
The tour touched down in Havre, Glasgow, Miles City, Lewistown, Bozeman and Hamilton. In each town, the group met with local business and government leaders to discuss future water development needs.

The Board has helped construct a total of 181 projects throughout the state serving irrigation, municipal water supply, flood control and recreational needs. This investment has returned a total of more than one-half billion dollars to the Montana economy.



ABOVE: This is the supply canal to Warhorse Reservoir. The four mile canal carries 1,200 cubic feet per second. Total project cost was $196,000.

BELOW: The tour also flew over Fresno Dam, an important part of the proposed first water conservancy district. This Bureau of Reclamation sturcture is 111 feet high and 2,070 feet long, a two million cubic yard earth-fill dam.



ABOVE: The group was met by civic and business leaders along the tour.

Meeting the Press: Board Director Douglas G. Smith answers queries about the proposed third water conservancy district covering the Missouri Headwaters area. Shown here is Milton Vandeventer from KBMN Radio in Bozeman. Also on hand was Walt Secor from the Bozeman Daily Chronicle.

BELOW: Board member Everett Redeen strides from his plane at an early morning stop.

Board Prepares Legislative Requests

Staff personnel from the Water Resources Board are now working on the 1971 legislative package. With an eye toward increased efficiency and greater flexibility in meeting the growing challenges of water development. These are some of the possible areas which the Board may consider for legislative action:

- Name Change. The Board may ask the 1971 legislature to change its title to the Department of Water Resources. Widespread confusion reigns about whether the Water Resources Board means staff of the Board or the five appointed members of the Board. Having the Board members govern the Department, as is done in several other agencies, would eliminate this communication breakdown.

- Modern Water Code. The first of several parts of a new water code for Montana will be unveiled later this fall. Among other things, it will provide for a speedier and more comprehensive filing system of appropriate forms, establishment of a permanent water referee to advise the courts in water rights disputes and other updating of the state's water code.

- Dam Safety and Inspection. With the state's growing recreation demands on all reservoirs across the state, there is a serious need for a dam safety act. No agency is currently empowered to inspect unsafe structures or to enforce needed repairs to prevent serious tragedies from occuring. We believe the time to act is before such calamities occur.

- Water Conservancy Act. The Board will likely ask the legislature to increase the amount of time provided for preliminary and secondary feasibility studies in proposed conservancy districts. The present six months time period allows too little time for careful selection of consultants and accurate and detailed work.

Other legislative suggestions will no doubt occur before the 1971 assembly opens. Each will be carefully deliberated and discussed with agencies, organizations and individuals to make certain it is in the best interests of all Montanans.

News Notes

The Montana Water Resources Board will feature three displays at fairs around Montana this summer. The Board's popular graphic presentation of its organization, operation and projects will be seen at Great Falls, Lewistown, Billings, and Missoula. Featured at the Shelby, Helena, Glasgow, Havre and Fort Benton fairs will be a special display describing the proposed north central water conservancy district. A similar display dealing with the east central district will travel to the Dawson County Fair at Glendive.

Visiting Montana this summer are two nationally important water organizations. The Western States Water Council met in Great Falls and Glacier National Park in mid-July. The Pacific Northwest River Basins Commission will be in Glacier August 3-4. Two Montanans share the credit for bringing these several hundred delegates, their families and prominent national speakers to the Big Sky Country for a closer look at Montana's water activity. State Sen. William Groff is the Montana representative to the Western States Water Council. Former State Sen. Edward T. Dussault fills the same job with the Pacific Northwest River Basins Commission.

The Montana Water Resources Board has a younger look this summer. Four deserving college students have been hired for the vacation period in various divisions, under the work-study program. This federal-state cooperative plan makes it possible for college students of academic excellence and financial need to gain valuable work experience while earning money to continue their education.

New publications now available or soon to be published by the Board include a state groundwater study, survey of water resources programs conducted by government agencies in Montana, a Mineral-Sanders and Glacier County water resource survey and a bibliography of Montana water resources and related studies.

Water Board Conducts Information Tour

On July 27 the Water Board sponsored a day-long tour of its Broadwater-Missouri project.

The tour was intended to give staff members a closer view of water measurement procedures and water rights determinations.

First stop on the two-bus inspection was Crow Creek Pumping Project near Townsend.

Crow Creek, a former Bureau of Reclamation project, now owned by local water users was viewed for sprinkler systems, structures and water measuring devices.

From there, the group, including several Board members, moved to the Broadwater - Missouri project, owned by the Board. After inspecting the structure, the group saw a Board stream gaging station on the west canel of the Missouri. Board hydrographers presented a demonstration of water measurement. The group also saw the USGS stream gaging station in the nearby Missouri River.

The tour members heard a discussion of the economic impact of increased and improved irrigation on the local economy.

Final stop on the tour was the D. D. Davis and Sons ranch. The party inspected modern sprinkler irrigation methods and had a short seminar on decreed water rights and contract water supply.

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MONTANA WATER RESOURCES BOARD

Vol. 2, No. 3 NEWSLETTER Winter, 1969

Water Board Says Display Available

A large graphic display featuring transparencies of Water Resources Board projects and activities is available for public use throughout the state at meeting or conventions.

The display traveled last summer to six county fairs as well as several state conventions.

Persons wishing to have the display brought to their convention should contact the Water Resources Board at its office in Helena.

INTRODUCING . . .

A new concept in the Water Resources Board Newsletter. This issue was printed with the offset process to make possible more use of pictures. It features a NEWS DIGEST on the inside centerfold. We have included, for the first time, a director's report, guest editorial, news notes and other innovations we hope will make the NEWSLETTER more interesting and informative. We earnestly solicit your comments and suggestions.

WATER IN WINTER---DEADMAN'S BASIN

WATER — MONTANA'S LIFESTREAM

Montana Water Resources Board

NEWSLETTER

Published quarterly by the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601. Subscriptions free upon request.

MONTANA WATER RESOURCES BOARD
Governor Forrest H. Anderson
Chairman of the Board*
Douglas G. Smith
Director*
Wilbur White, Twodot
Vice Chairman and Secretary

Board Members
Homer C. Bailey, Corvallis
Fred Barrett, Chester
Clyde Hawks, St. Xavier
Everett Redeen, Forsyth
***Ex-Officio Member**

Newsletter Editor, Kenneth D. Myers

ADDRESS WRONG?

If your name or address is listed incorrectly or if you wish additional copies of any issue please contact the Water Resources Board.

DIRECTOR'S REPORT

Douglas G. Smith, Director

In the three months I have served as director of your Water Resources Board, I have discovered tremendous problems and challenging potential in the field of water resources conservation and development.

Some of the problems facing this Board are largely internal. Most are problems of administration. I came to this position as an administer rather than as a professional water expert. Therefore, I put top priority upon solving some of the problems of administration.

First, we obtained the services of a recognized personnel expert, Mr. Robert Jensen. His efforts toward greater efficiency and productivity have already begun to show results. Mr. Jensen is concentrating on putting the right man in the right position and achieving maximum output from each employee.

Second, we have combined two divisions, groundwater and surface water, into the water resource division. This will be a vastly improved division in terms of efficiency and in terms of cooperation with other organizatons and agencies.

Third, we obtained a professionally qualified chief engineer, our first since 1964. Under the leadership of Orrin A. Ferris we expect to dramatically improve our relations with local water users' associations as well as develop a new and aggressive stance in seeking construction authorization in the next session of the legislature.

Fourth, we hired a qualified man to be directly responsible for our field investigators. These investigators work at the grassroots level with farmers and ranchers in each county and it is vital they be capable people with sound judgment and good supervision.

I mention all this to indicate that there are a great many behind-the-scenes operations which are vital to getting our management house in order.

When all of this is done, then we will be able to effectively begin to communicate our goals and objectives for the future of Montana's water.

We face tremendous challenges in the next weeks and months. Other states want Montana water and are laying impressive groundwork to take it on the grounds that our inactivity has lost whatever right we might once have had to that water.

If Montana's industry is to grow it will need adequate amounts of water. If recreation is to grow,. it will depend on plentiful, fresh, pure water. Our agriculture needs for water will escalate as newer methods of irrigation continue to be developed.

All this means that we must work together and work together immediately to develop sound, sensible, workable programs for this water to be used wisely and effectively.

Accordingly, I have been speaking throughout Montana, to groups of professional persons, farmers and ranchers, to all Montanans who are concerned with our water; offering the cooperation of the Montana Water Resources Board in any effort which will save and use our water to build a better state. I offer you that cooperation in all sincerity. And more important than that, I seek the advice and counsel of all Montanans.

The Water Resources Board needs to know your thoughts on priorities for water, problems and potentials for water in your area.

Please feel free to write us anytime, to visit with us whenever you are in Helena and to give us the benefit of your valuable experience.

The Montana Water Resources Board is, in reality, your Board. Working together we can do what none of us could do alone. We can build a greater state through wise and farsighted use of our precious natural resource heritage.

Missouri Basin Committee Meets In Iowa

Governor Forrest H. Anderson was represented by two Montana delegates at a two-day session of the Missouri Basin Inter-Agency Committee in Souix City, Iowa, December 3-4.

Attending on the Governor's behalf were Douglas G. Smith, director of the Water Resources Board and Wilbur White, Twodot, vice chairman of the Board.

The MBIAC effort had its beginning in a federal agency ad hoc group which functioned until the late 1940's. Then the governors of the ten western states which have lands lying within the Missouri Basin were invited to join.

After the enlargement, the committee met frequently to discuss problems of water and related land development throughout the region.

President John F. Kennedy recommended Public Law 89.80 which was signed into law in 1965 setting up coordinated water resources planning. It was from the legislation that the comprehensive framework study of the Missouri Basin began. At one time 6 committees and 34 task forces were at work gathering technical material as part of a projection of water and related land needs for the years 1980, 2000 and 2020.

A similar study is being done in greater detail for Montana by the Water Resources Board. The information gathering phase of this state study is nearly completed. Remaining are the analysis and recommendation phases.

Also being incorporated into the needs study is an economic base study being prepared by the University of Montana Bureau of Business Research at Missoula.

Montana Represented At Yellowstone Compact Meet

Montana representatives met with delegates from North Dakota, Wyoming and the federal government as part of the Yellowstone River Compact Commission in Sheridan Wyoming December 2.

The Yellowstone River Compact was signed in 1950 after many years of negotiation to divide the waters of the Yellowstone River between Montana and Wyoming. North Dakota signed the compact because the Little Missouri, which rises in Wyoming and flows through Montana, also covers that state.

The compact was signed by 3 representatives from North Dakota, 16 from Montana, 18 from Wyoming, and one from the federal government.

At the December meeting the Commission considered industrial requests for water in the area, streamflow measurements for the past year, possible studies within the Compact region and routine budgetary matters.

Representing Montana were Douglas G. Smith, director of the Montana Water Resources Board and Everett Redeen, Board member from Forsyth.

Water Board Names Field Supervisor

Former insurance executive, farmer and rancher and ASCS field reporter Ned Johnson has been named the Water Resources Board's first field supervisor.

Johnson will have direct charge of the Board's field investigators. These crews work in each Montana county gathering information which is used both in preparing a surface water publication and in the state water plan.

The field investigators meet with individual farmers and ranchers to determine irrigation and potential irrigation throughout the state.

Johnson will be in charge of their day to day interviews as well as supervising the preparation of their reports.

Johnson is a former resident of Bozeman. He has five children. He holds a bachelor of science degree from the University of Nebraska.

Johnson supervised completion of the Board's field investigation in Fergus County last month.

Field Investigators Back In Main Office

The field investigators of the Water Resources Board have returned to Helena for the winter months.

During the spring, summer and early fall they completed investigation of surface water uses in Richland County and worked in Fergus County. The Fergus survey will be completed next spring.

The twelve man crew contacted farmers throughout the counties to ascertain individual uses of irrigation and potential needs for future irrigation.

Forty five of Montana's 56 counties have now been completed. The investigators will use the winter months to complete tabulation and interpretation of the Richland County information.

The data will then be published and also used as part of the state water plan and ultimate needs study.

Jensen Joins Water Resources Board

Robert R. Jensen, training officer for the Montana Agricultural Stabilization and Conservation Service state office in Bozeman, became the personnel officer for the Montana Water Resources Board early in October.

Jensen was raised near Joliet, the son of Mr. and Mrs. Ray Jensen, now of Billings. He was graduated from Eastern Montana College at Billings.

Jensen taught at Thermopolis and Lovell, Wyoming before joining the ASCS in 1963.

He and his wife have three sons and one daughter.

Jensen won national recognition for his training programs in Montana. With the Water Resources Board his duties will include personnel management and administrative assignments.

Editorial Comment

We Can't Afford To Trifle With Our Water

(Reprinted with permission of the East River Guardian, Madison, South Dakota.)

Warning signs are all over the place. But Americans are a trusting lot, and we find it easy to ignore warnings.

Our cancer wards are full of people with lungs rotting away because they refused to heed the warnings printed on cigarette packages.

Our graveyards are full of bodies of young drivers who failed to heed the warnings at railroad crossings or dangerous curves.

We wonder whether South Dakota, a dozen years from now, will be full of people who wished they had read the warning signs flashed by those who are concerned today about our water supplies?

A decade ago, the U.S. Senate Select Committee on Water Resources came to the Missouri River Basin and told us that the water supplies of this region, now seemingly plentiful, would not be sufficient when our growing population increases its demand for water.

But the warning signs in the last year or two have become even more noticeable, more insistant. Take a couple of examples:

By a single vote, a House Interior sub-committee defeated an amendment which would have denied planning for a pumping project near Souix Falls until South Dakota repeals its ban on non-resident hunters of waterfowl.

By one-half of one per cent, the voters in Texas just defeated a $3.5 billion bond issue to finance a water project which included, among other things, plans to divert water from the Mississippi and Missouri Rivers to the dry plains of Texas.

Both warning signals are clear. They have erased all reasonable doubt.

The first says that if South Dakota doesn't repeal its indefensible ban on out-of-state duck and goose hunters, federal investment in water resources in South Dakota will slow down and eventually quit.

Those most concerned about water resource development, especially the very promising Oahe Unit which is getting closer every day, have been aware for two or three years that our waterfowl hunting ban has to go. Regular readers of the Guardian are familiar with this issue and they are aware that our Congressional delegation agrees that the ban must go.

To bring irrigation water to a quarter million acres in Brown and Spink counties in the next ten years requires initial construction funds this fiscal year. If Congress balks, it may be a two-year delay, because of the complicated and time consuming federal budgeting process. There are too many competing pressures for the federal dollar for South Dakotans to assume that the money will always be there—and that we can take our own sweet time with the goose ban. It has to be repealed in January, 1970 or earlier.

Even more frightening is the prospect that, if Congress should refuse money for the Oahe project this year, the Interior Department or the Bureau of the Budget may well be inclined to put the project on the shelf indefinately. If that should happen it might be many years before it could be jarred loose—and that means starting the whole time-consuming process all over again. There is no reason, whatsoever, to jeopardize this important project by this totally unnecessary risk.

The second warning sign tells of a longer range problem, but one just as critical. The simple fact is that if South Dakota does not make use of the Missouri River water as it runs through our state, other more imaginative states to the south of us will eagerly find uses for it. That is the message of the Texas vote.

There are many many ways we can put the water to use in South Dakota to make this a better state in which to live. We can irrigate hundreds of thousands of acres to improve our farm income and keep families on the farm. We can make our lakes more pleasant to atract people from the cities. And we can build more assured sources of water supply to attract job-creating industry.

But we can do none of these things under our existing patchwork quilt of state agencies and bureaus; each with a small slice of the water development pie. The problem cries out for central planning, tough-minded coordination and imaginative leadership.

Inaction and vagueness from the governor's office and the natural reluctance to change in the legislature would be dangerous if allowed to prevail in 1970. These are problems which cry out for an immediate solution.

EDITOR'S NOTE: The South Dakota situation boils down to a need for cooperation, coordination and action; each of which is an important key in the Water Resources Board's new program. We ask your cooperation and we invite your comments and suggestions.

Water Board Working for More Reorganization, Reunification

With the change of administration in the Water Resources Board, renewed emphasis has been placed upon agency reorganization and reunification.

Hiring of a chief engineer, a personnel director and a supervisor of field investigators was a prime step toward establishing responsive and energetic leadership at these levels.

In addition, the divisions of groundwater and surface water have been combined into the new water resources division. Heading the new division will be A. J. Mancini, staff geologist and former head of the groundwater division. Serving under Mancini will be Ron Guse, supervising the groundwater department; Hans Bille, working with surface water; and Dave Poulliot, acting water resources coordinator. Under Poulliot will acting office supervisor Robert Peter and field supervisor Ned Johnson.

Coupled with the extensive reorganization of staff and duties was the Board's effort to achieve reunification of its offices. For some two years the surface water and soil scientist staff were located in rental property elsewhere in Helena. It became obvious as the months progressed that communication and efficiency were suffering. Director Smith began negotiations to have other state agencies who now occupy part of the fourth floor of the Mitchell Building move to other quarters to allow all Water Board personnel to share office space again.

Accordingly, the Montana Commission on Aging moved to the new Helena Penkay Eagles' Manor, the Department of Labor and Apprenticeship Council moved into other office space, the Department of Indian Affairs moved downstairs in the Mitchell Building, and the Merit System also changed location.

The Department of Institutions is expected to move to other office space shortly. This will allow the Water Resources Board to once more again occupy space that was constructed specifically for its use—the fourth floor of the Sam W. Mitchell Building.

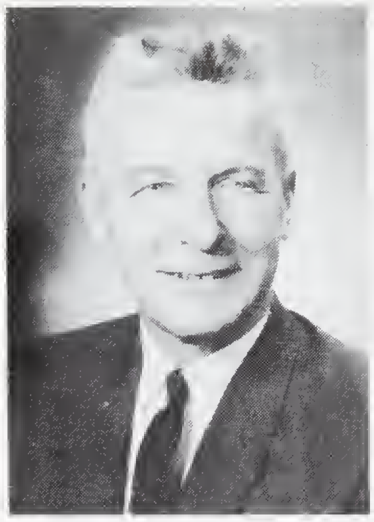
Director Smith, commenting on the reorganization and reunification said, "I do not believe we can realistically expect full support of all Montanans in our efforts until we have our own house in order. The addition of some extremely qualified personnel and the reestablishment of one office will, in the long run, result in far greater productivity, efficiency and economy."

Reichle Association Also Interested In Water Conservancy Possibilities

Representatives of the Montana Water Resources Board attended a meeting of the Reichle Project Association at Lahood Park, near Whitehall, November 21.

The meeting was held to explain possibilities of organization and operation of the area under a water conservancy district.

This was the second area to express interest in obtaining information about the legislation which was passed by the last Montana legislature.



Missoula attorney Edward T. Dussault, has been named the Montana representative to the Pacific Northwest River Basins Commission by Governor Forrest H. Anderson.

Dussault, a former state senator from Missoula County, succeeds State Rep. James Murphy of Kalispell.

The Commission is a federation of states lying within the Pacific Northwest area and federal agencies which attempts to plan water development and solve water conservation and development problems.

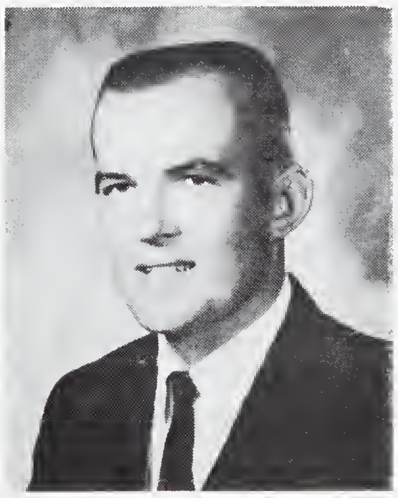
WATER BOARD NAMES NEW CHIEF ENGINEER

The Montana Water Resources Board has chosen its first professionally qualified chief engineer in half a decade.

He is Orrin A. Ferris of Bozeman. Ferris, 29, is currently a civil engineer for the Montana Soil Conservation Service.

He also served as a Peace Corps volunteer in South America.

Ferris is a Miles City native. He holds both civil and construction engineering degrees from Montana State University as well as a masters degree in civil engineering from MSU.



Ferris and his wife have two children.

The chief engineer's position has been officially vacant since the 1964 resignation of George Sahinen.

The post was filled on an acting basis by Don Sullivan who resigned earlier this year and now by William D. Morton who will remain as office engineer.

Director Douglas G. Smith said the filling of this post with a professionally qualified and experienced person would be of great benefit in the Board's activities.

Water Resources Board Director Douglas G. Smith presented material explaining the district requirements and used visual aids in discussing conservancy legislation with the group.

HOT SPRINGS CITIZEN
Hot Springs, Montana

WATER RESOURCES DIRECTOR — Douglas G. Smith has been named by Gov. Forrest Anderson as director of the Montana Water Resouces board. He succeeds Everett V. Darlinton who resigned.

Smith has served as executive director of the Agricultural Stabilization and Conservation service office in Bozeman from 1963 until this year. He is a former county agent in Pondera, Liberty and Hill counties and also was a farmer fieldman for the SCS.

MILES CITY STAR
Miles City, Montana

Water Resources Board holds local meeting

Members of the Montana Water Resources Board arrived today for a series of meetings in Miles City. This afternoon they held a hearing in Custer County Courtroom on a controversy in the Fox Hills Controlled Ground Water Area near Baker.

Tonight the board will honor retiring member Henry Sawtell at a dinner at the Red Rock. Friday, the board will hold its regular November meeting at the Red Rock.

DAILY INTER LAKE
Kalispell, Montana

Water Resources Board To Conduct Meeting On Flood Plain Problems

The Montana Water Resources Board will coordinate a flood plain information meeting scheduled for 7:30 p.m. Thursday at the First National Bank Community Room.

Douglas G. Smith, board director, said the meeting is open to the public. Its purpose is to present flood plain information of importance to residents along the Flathead River between Columbia Falls and the head of Flathead Lake, and on the Stillwater and Whitefish rivers.

The session will base upon a report prepared by the Corps of Engineers. This is the second such report completed in Montana following the 1964 record floods. The first report completed last year centered on the Clark Fork River.

To be discussed will be flood insurance, federal loans for housing development, developments in flood-prone areas and preventative measures which can be taken against future flooding.

Accompanying Smith will be representatives of state and local agencies, Corps of Engineers, Water Resources Board personnel and representatives of Columbia Falls and Kalispell city councils.

Arrangements for the information session were made by Columbia Falls Mayor Roger Elliott and Kalispell Mayor Larry Bjorneby.

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news

CURRENT NEWS BY AND ABOUT THE

GREAT FALLS TRIBUNE
Great Falls, Montana

For Water Conservation

Sense of Cooperation

(Another in a series of guest editorials submitted at invitation of The Tribune. Opinions expressed are those of the guest-editor-for-a-day.)

Few states in this nation have been blessed with such an abundance of water as Montana. Few states in the nation have been faced with fewer past demands for that water than this state. Perhaps for that very reason, fewer states have compiled such a sorry record of inadequate planning and lack of concern about the future of water conservation and development. The root cause of this inactivity in water planning is probably that the chief use of Montana's water has been for irrigation. Unlike industrial or commercial water users who have a powerful lobby to protect their claim to water in other states, users of water for irrigation purposes are almost unanimously passive and disorganized until a severe problem in their specific area arises.

Smith

Although there have been laws on the books providing for stream adjudication for many years and a law allowing controlled withdrawal of water for several years, only rarely have local residents ever requested action in any of these areas.

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MONTANA WATER RESOURCES BOARD

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more are planned.

The UM Bureau of Business and Economic Research is providing an economic base study to lend the human element to our plans and projections. The Bureau of Mines and Geology is providing groundwater information. The United States Geological Survey provided invaluable information about streamflow in the state.

All of this shows a sense of cooperation among agencies involved in the field of water conservation. We at the Water Resources Board intend to develop this spirit immensely in the months to come. All agencies, organizations and groups concerned with the quantity and quality of our water will be asked for their advice and counsel. We intend that our final proposals for water development be the unanimous consensus of all those groups and individuals concerned with water.

We must also turn our attention beyond simply the use of water for irrigation. Obviously, irrigation will continue to be the largest single user of our state's water. But we must also consider water for industrial use, municipal use, and water for recreational use. We must be concerned about water for fishing and flood control. We must also be concerned about water pollution.

This approach will necessitate greatly increased cooperation among all agencies and organizations. The Montana Water Resources Board stands ready to do its part in conserving and developing our water, a vital and irreplaceable natural resource.

DOUGLAS G. SMITH, Director
Montana Water Resources Board

THE MISSOULIAN
Missoula, Montana

Smith, Dunkle To Attend Water Meet

HELENA (AP) — Douglas Smith, Montana Water Resources Board director, has announced he will join Frank Dunkle of the State Fish and Game Department and others Saturday at the four-state legislative conference in Lewistown sponsored by the Montana Legislative Council.

Also addressing the gathering will be Harold Aldrich, a Bureau of Reclamation official and representative of the Corps of Engineers in Omaha, Neb.

The three will discuss "Water Resources in the Missouri Basin."

Other conference topics include water and related resources in the four-state area of North Dakota, South Dakota, Wyoming and Montana.

HINSDALE TRIBUNE
Hinsdale, Montana

Water Board Seeks Conservancy District

A delegation from the Montana Water Resources Board will attend a multi-county meeting at Havre to discuss the possibility of creating a water conservancy district in northeastern Montana. Water conservancy legislation passed the 1969 session of the Montana Legislature. It provides in part that 51% of the citizens of the area may elect to create a conservancy district to accomplish a variety of water conservation, recreation and development purposes. Chief sponsor of that legislation, Senator Gordon Mcgowan, may attend the meeting.

It is expected that the Havre meeting will deal with proposed transfer of water from the Tiber Reservoir into the Marias and Milk Rivers within the five-county area.

Douglas Smith, water board director, will lead the Helena group. He will be accompanied by James T. Harrison, Jr., the staff counsel; William Morton, acting chief engineer; and Ken Myers, administrative aide. They will meet with the commissioners and interested persons from Liberty, Hill, Blaine, Phillips and Valley counties. The meeting will be 1:30 p. m. in the county commissioners' office in Havre.

BOZEMAN DAILY CHRONICLE
Bozeman, Montana

Irrigation Plus Future Plans, Smith

BILLINGS (AP)—The director of the Montana Water Resources Board called for greater individual involvement in the problems of water conservation and development in a keynote address Friday during the convention of the Montana Water Development Association.

"We must continue to be committed to irrigation and to the family farm," Douglas G. Smith said, "but we must also plan for the future."

He said Montana will continue to have growing demands on water for municipal, industrial and recreational uses.

Smith said work on a comprehensive state water plan and an ultimate needs study is progressing well with about one-half the needed information gathered.

He said the information will be used to project the water needs and development potentials in Montana for the years between 1980 and 2,020.

Guest Editorial

Dean A. Hanson, Chairman
State Soil Conservation Committee

WATERSHED PROGRAMS

Watersheds are Everybody's Business — Because Everybody Benefits

The Watershed approach to the Soil and Water Conservation Program is a more efficient, cooperative method of getting complete conservation of our natural resources.

A water storage reservoir or dam is only as enduring as the land treatment on the Watershed area. Proper conservation measures of land treatment need to be applied in the Watershed area to stop erosion and reduce rapid run-off.

The initiative to apply the necessary land treatment measures must come about through proper programing and cost-sharing assistance to the land owners involved. It is in this area that Soil and Water Conservation Districts can guide and assist land owners and operators in a basic and realistic plan. The State Soil Conservation Committee gives the Districts all the cooperation, assistance, and encouragement possible to have land treatment measures carried out. Cost-sharing programs must also be implemented, as the costs of many land treatment measures are such that local land owners can not raise all the necessary funds needed.

Public Law 566, the Watershed Protection and Flood Prevention Act, is administered by the Soil Conservation Service. Under this act, legally qualified local organizations, such as Soil and Water Conservation Districts, can get technical and financial help in planning and carrying out Watershed projects. Watershed projects can be built for flood prevention, irrigation, drainage, recreation, municipal and industrial water supply (both present and future), and Fish and Wildlife development.

The State Soil Conservation Committee has been designated by the Governor, as the State Agency to receive applications for assistance under the Act. The Committee transmits approved applications to the Soil Conservation Service for technical assistance. Priorities for planning assistance are established by the Committee. Priorities are based on need, feasibility of the proposed project, and the ability of the local organization to carry out the project.

Douglas Smith, the new Director of the Water Resources Board is to be highly commended for his attitude and approach. His call for "Cooperation" to meet the challenges of water development, echo the past and present sentiments of the State Conservation Committee. The need for full cooperation of all agencies of government was never greater. We need to seek out and fully utilize all methods of planning assistance and finance available from all sources, be it local, State or Federal, to get the tasks at hand underway in the shortest possible time.

The State Soil Conservation Committee is most desirous that their agency and the Water Resources Board can work out a priority plan whereby two or three Water Projects within the State, could become joint ventures for construction and funding. We can and should be going to the Legislature with proposals that both agencies can fully endorse and support.

We are eager to cooperate with all agencies, be they local, State or Federal. Together we have the initative to get the job done. Initiative is to a man what fuel is to a rocket, the more you have, the higher and farther the rocket can travel. Without fuel, it must stand forever on the launching pad. We have the necessary fuels in our organizations to get Montana's Water Development projects off the pad, and into useful being.

Eastern Counties Study Water Conservancy Area

Six eastern Montana counties are investigating the possibility of forming the state's first water conservancy district.

The six counties, Liberty, Choteau, Hill, Blaine, Phillips and Valley are studying the possibility of diverting water from the Tiber Reservoir into the Marias and Milk Rivers.

Water conservancy legislation passed the last session of the Montana State Legislature. The bill, sponsored by Senator Gordon McGowan of Highwood, aims to provide a means for large areas to finance water projects which would have a multi-purpose value to the people within the state.

The hi-line proposal is being promoted by the Marias-Milk River Water Development Association. Head of the group is Claude Windecker of Havre.

Staff officials of the Montana Water Resources Board met with members of the Association and county commissioners from the area several weeks ago. The group also brought South Dakota's water resources director to a meeting in Lewistown at which he explained the operation of his state's conservancy districts.

Within the next few weeks the Marias-Milk River Association will be sponsoring local meetings throughout the six-county area to explain the organization and operation of a conservancy district.

Representatives of the Water Board expect to be on hand for these sessions.

NEWS NOTES

Ron Guse, of the Water Resources Division and his wife Mary are parents of a 7 lb. ½ oz. girl, Caryn Christine, born November 10.

-O-

A detailed review of water transfer plans put forward for the western states has been published by the Western States Water Council, 1725 University Club Building, Salt Lake City 84111. The publication, which includes maps to show the various plans, is by far the most detailed explanation of these massive water proposals to date. The Council does not endorse any particular plan but seeks to disseminate information about all plans as widely as possible. The publication is entitled A REVIEW OF INTERREGIONAL AND INTERNATIONAL WATER TRANSFER PROPOSALS.

-O-

Carl Johnson, Livingston, was reelected president of the Montana Soil and Water Conservation Districts organization. He will be aided by Robert Anderson, Fort Benton, vice president and Mrs. Jeanne Baluka, Helena, secretary. Wendell Martinell, Butte was elected treasurer.

-O-

J. Phil Campbell, Undersecretary of Agriculture, reminds Americans, "There are those who say agriculture is a dwindling industry. But that isn't true. Agriculture is still the nation's biggest industry. It employes more people than the steel industry, the auto industry, the utilities and transportation combined. It is a $50 billion customer in the American economy. It has increased its man-hour productivity over the past 15 years at a rate roughly double that of non-farm industry.

-O-

Clyde Jarvis, former educator, broadcaster and information director of the Montana Farmers Union, is the new president of the organization.

-O-

Everett V. Darlinton, former director of the Montana Water Resources Board, is senior industrial development engineer for the Montana Department of Planning and Economic Development in Helena.

-O-

The Harlowton Times reported that more than 1,000 children who turned up in Pueblo, Colorado for a VFW fishing trip were disappointed to discover the fish had died from water pollution.

-O-

The Montana Water Resources Board, in cooperation with the Montana Cooperative Extension Service is now preparing an information booklet explaining the water conservancy legislation now in effect, its requirements, organization and operation. Copies of this booklet will be available through the office of the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601.

-O-

Willie Doll, Malta, was re-elected president of the Montana Cattleman's Association at the group's annual convention. Other officers are Melvin Schlesinger, Ingomar, vice president and Andy Strommen, Vandalia, board member.

David Lewis, 84, a member of the special session of the Montana legislature in 1934 which created the Montana State Conservation Board—now the Water Resources Board—died in Sidney November 16. Lewis was an educator who came to Montana to work for a Reclamation Service project. He served in the 1929, '31, '33 and '34 sessions of the Montana legislature. He was also a member of the Souix Pass School Board, the Richland County Fair Board and a life member of the Masonic Lodge in Fairview.

-O-

Bernard Harkness, Dell, was elected President of the Montana Farm Bureau. Stanley Burger, Bozeman, will continue as executive secretary of the group.

-O-

Clyde Sandon, 64, a member of the Montana Grass Conservation Commission, died at his hometown of Ekalaka. He was a prominent member of the Montana Stockgrowers' Association.

-O-

Re-elected to head the Montana Council of Cooperatives were Wayne "Smokey" Snyder, president; Mel Williams, vice president and Chris Johanson, secretary-treasurer.

-O-

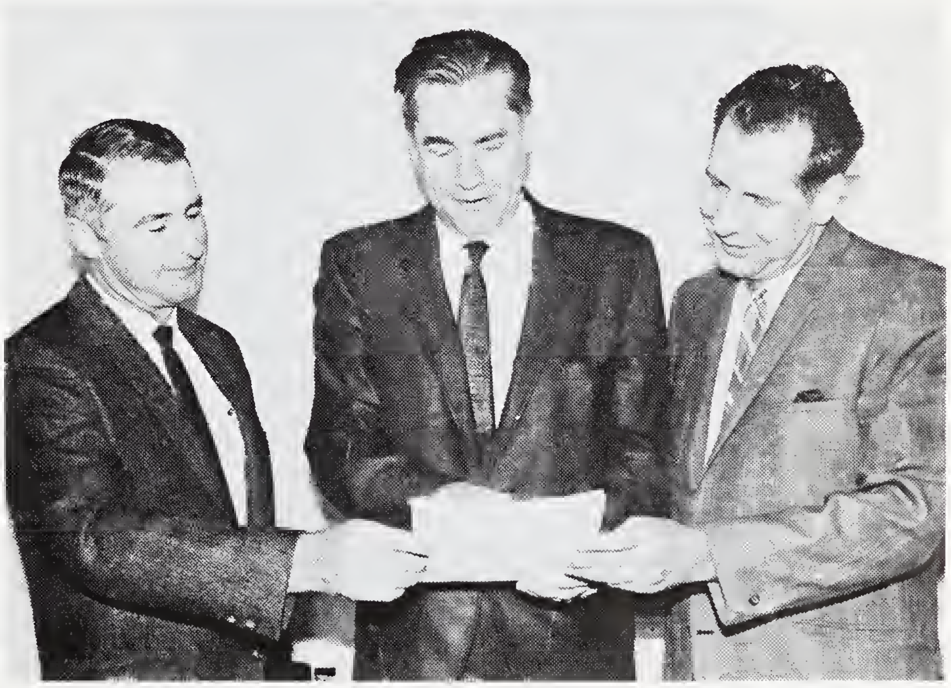
Elbert N. Cooper, Sr., has been hospitalized with stomach trouble. It is unknown when he will be able to return. Cooper is district supervisor for the Water Resources Board.

-O-

Wyatt Frost, maintenance foreman for the Water Resources Board at Shawmut is presently recuperating from a heart atack. He was stricken on October 16 while working at the Tongue River Reservoir.

-O-

Glen Lowery, Water Resources Board maintenance supervisor at Shawmut is in a Helena hospital recuperating from an operation.



Clyde Hawks, St. Xavier, member of the Water Resources Board and former speaker of the Montana House of Representatives; State Sen. William Groff of Victor and Water Resources Board director Douglas G. Smith represent Montana on the Western States Water Council.

The Council is composed of about 15 western states. It aims to cooperate in water planning and development throughout the western states area.

MEET YOUR MONTANA

FORREST H. ANDERSON, GOVERNOR
Chairman of the Board

Douglas G. Smith was named to the position of director early in September by Governor Forrest H. Anderson. He succeeded director Everett V. Darlinton who resigned.

Smith is a native of Lewistown and a graduate of Stanford High School. He also holds a degree in agricultural education from Montana State University, Bozeman.

Smith served as county agent in Hill, Liberty and Pondera Counties before becoming ASCS director in 1963; a position he left to join the Water Board.

Wilbur White, Twodot rancher, is a graduate of Cornell College who did graduate work at the University of Iowa.

He has been a partner in the McFarland-White ranch since 1935.

He married and has two children. White is a veteran of World War II and twenty-five year school board member.

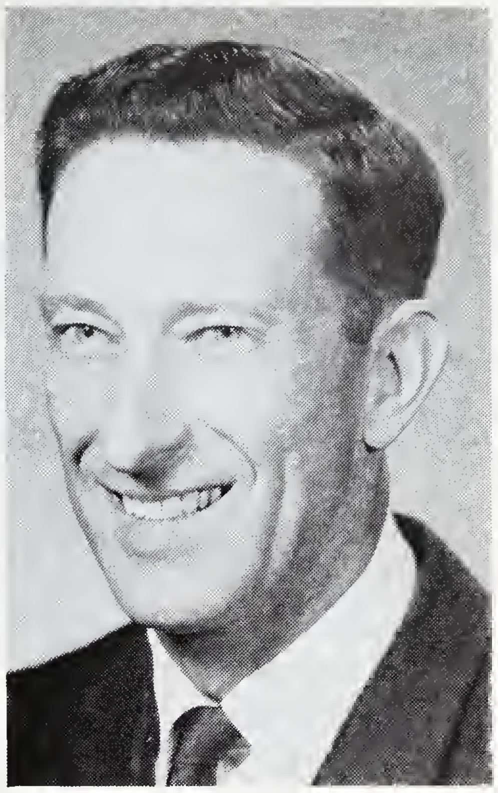
He serves as vice chairman and secretary of the Board.

WATER RESOURCES BOARD

Homer C. Bailey was born in Platteville, Wisc. He came to Montana in 1911.

Bailey is engaged in farming and ranching near Corvallis.

He was the community chairman for the area ASC and president of the Western Montana Beet Growers' Assn. He is now president of the Humble Drainage District and vice president of the Corvallis Canal and Water Company. He is a graduate of Montana State University.



Fred Barrett, Chester, is a wheat rancher and former educator.

Barrett is a native of Missoula. He served ten years in the Montana House of Representatives.

Barrett was active in the formation of the Marias-Milk River Development Association and other community activities.

He also served as a member of the President's Council of 50 at the University of Montana.

Clyde L. Hawks, St. Xavier rancher, is a former Speaker of the Montana House of Representatives. He served 16 years in that body.

Hawks attended high school in Hardin and college at Montana State University in Bozeman.

He was a director of the Big Horn Soil Conservation District and the Big Horn County Electric Coo-op.

He is the father of five children.

Everett Redeen is a native of Tower, Minnesota. He is a former educator and served as Rosebud County Superintendent of Schools before leaving that field to enter ranching and insurance.

He has also served as a local SCS district supervisor.

Redeen is a veteran of World War II.

Water Board Honors Sawtell

While the Montana Water Resources Board was in Miles City for the South Pine controlled groundwater area hearing it paused to honor retired Board member Henry J. Sawtell, a prominent resident of that city.

Sawtell served under four Montana governors as a member of the Board. He retired in October saying he wanted to make room for a younger man. Sawtell's service to the Board and the people of Montana spanned the years 1957-1969.

He was succeeded by Chester wheat rancher Fred Barrett.

Presentation of a plaque commemorating Sawtell's service was made by a fellow Board member and longtime personal friend, Wilbur White of Twodot.

The dialogue between these two close friends and fellow workers was a tremendous inspiration to other Board employees and for that reason it is reprinted below:

MR. WHITE: We are here tonight to honor a great and good Montanan. Mr. Sawtell has served the State faithfully and well. Before progressing further I would like to pause for a bit and let you know what Henry has done with the mantle of years he carries so well . . . how he has enriched the lives of others by association with him.

Tonight we are indeed fortunate to be in Miles City, Henry's home town, to honor him. I remember hearing from Henry such comments as Dubuque, Iowa; Armor Institute in Chicago; a home in Powell, Wyoming; a dashing young woman by the name of Winifred from Kansas; a lifetime spent in the lumber business and later Pumpkin Creek. This all interspersed with a record of distinguished service in the State Legislature and then his years on the State Water Conservation Board and the State Planning Board and later the State Water Resources Board.

Henry has done all these things with an unselfish drive and a non-partisan approach.

So Henry, and to you Winifred, we are indeed grateful for your years of service and may the reward of a work well done be with you always. As a representative of the State Water Resources Board I present you this plaque for your years of dedicated service.

l-r: Wilbur White, Henry Sawtell, Douglas G. Smith
(Photo courtesy of Miles City Star)

MR. SAWTELL: Thanks, Pete. I am sure you never expected me to come up speechless, but I am sort of overcome with what you have done. I do sincerely want to thank you and want to add that my association with you on the Water Resources Board has been a pleasure. Montana has been rather good to me and serving on this board under four Governors has given me a chance to do my bit for Montana.

I certainly appreciate Governor Anderson asking me to serve another six years, but I do feel that the younger generation should be called to serve on boards such as this one which will have problems to solve for perhaps a number of years.

It has been good seeing you all today and Winifred and Betty join me in thanking you for this wonderful recognition. There will always be a very strong tie between us and all of you. Do come again and thanks again.

Montana Water Resources Board
Mitchell Building
Helena, Montana 59601

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Greetings!

MERRY CHRISTMAS
and Best Wishes
for the New Year!

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MONTANA WATER RESOURCES BOARD

OCT 3 1969
STATE DOCUMENTS

Vol. 2, No. 2 NEWSLETTER August, 1969

WATER BOARD EXHIBITS AT SEVEN FAIRS

The Montana Water Resources Board again took its story to the people at summer fairs, according to Everett V. Darlinton, board director.

Darlinton said a display featuring colored photographs and illustrations of board projects and operations was exhibited at fairs in Lewistown, Great Falls, Billings, Forsyth, Miles City, Missoula and Hamilton.

"We find a great deal of interest in the operations of the Water Board," Darlinton said, "and this display was an informational effort by our Board to explain some of the projects with which we are involved."

A representative of the Water Board was on hand at each fair and brochures further explaining the Board's activities was available

The graphic display was developed by John Keller, a Board employee.

In addition to construction and maintenance of irrigation and other water projects, the Water Resources Board is engaged in an intensive study of Montana's water resources and anticipated water needs. This study includes a county-by-county survey of every reservoir over 50 acre-feet in capacity as well as all irrigation and irrigable lands in the state.

NATION DEEPLY CONCERNED — WOULD PAY MORE TAXES EARMARKED FOR ENVIRONMENTAL IMPROVEMENT

A recent Gallup Poll revealed that 51% of the persons interviewed were "deeply concerned" with air and water pollution, soil erosion, and wildlife destruction. Only 12% said they were "not very concerned." Air and water pollution respectively, were considered the most pressing of our natural surroundings.

Nearly three out of every four of these interviewed said they would be willing to pay some additional taxes earmarked to improve natural surroundings. Importantly, low income groups would be just as willing to make some small payments as higher income persons.

On the matter of setting aside more public land for conservation purposes such as national parks, wildlife refuges, bird sanctuaries, etc.; nearly three-fourths of those interviewed favored such reservations.

MONTANA STATE PROF ATTENDS INTERNATIONAL IRRIGATION CONFERENCE

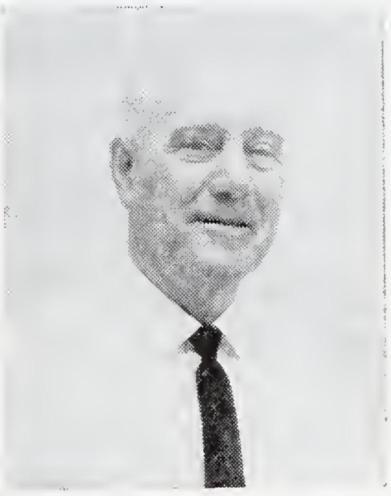
Dr. Charles Bowman, the head of the Agricultural Engineering Department at Montana State University was one of four American representatives attending the seventh meeting of the International Congress on Irrigation and Drainage. The conference was held during April in Mexico City. Representatives from nearly all countries were in attendance.

Dr. Bowman participated in the prestigous gathering when he presented a technical paper describing an automatic irrigation system. The system was developed at MSU and their Montana Agricultural Experiment Station. The automatic system utilizes electronic sensors to operate radio-controlled gates.

Canada and the United States are ahead of the rest of the world in irrigation technology, Dr. Bowman reported. Much of the world is not ready to make use of the irrigation technology now available. This seems to be particularly true of Asia and South America.

TEMPORARY ENGINEERING CHIEF

William D. "Bill" Morton, Project Supervisor for the Water Resources Board has been assigned the duties of the Acting Chief Engineer for the Board. Morton, a well-known career employee and licensed civil engineer has been with the Board 35 years. He has He has been project Supervisor since 1963.



William D. Morton

A native of Ekalaka, Mr. Morton's career virtually parallels the history of the Board. He joined the staff in 1934, the year the Water Conservation Board (now the Water Resources Board) was created by a special legislative session. That session initiated a state water conservation program to combat drought and encourage economic development. Since that time, Mr. Morton has been involved in the planning, construction and management of projects undertaken by the Board.

WATER RESOURCES BOARD
Governor Forrest H. Anderson*
Chairman
Wilbur White, Twodot
Vice Chairman and Secretary
Everett V. Darlinton*
Director
Homer C. Bailey, Corvallis
Clyde Hawks, St. Xavier
Everett Redeen, Forsyth
H. J. Sawtell, Miles City
*ex officio

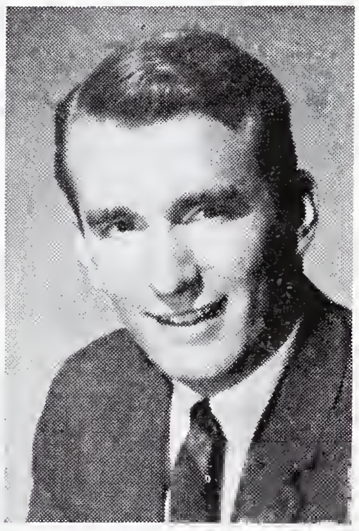
This Newsletter is published Quarterly by the
THE MONTANA WATER RESOURCES BOARD
Mitchell Building, Helena, Montana 59601

Anyone wishing to submit material for publication is invited to do so. The Board reserves the right to edit all material to conform with space limitations. This publication is distributed free of charge, and names will be placed on mailing list upon request.

Edited by—Ken Myers

ADMINISTRATIVE AIDE NAMED

Kenneth D. Myers, Helena was named July 14 to fill the position of Administrative Aide to the Director of the Water Resources Board.


Ken Myers

Myers is a graduate of Glasgow High School. He attended the University of Montana's School of Journalism.

Myers worked in both radio and television. He served one year with the UM Information Services and was later Public Relations Director of Carroll College in Helena.

Myers has also been Deputy Missoula County Clerk and Recorder and an aide in the office of Secretary of State Frank Murray.

His duties with the Board will include public information and publications.

WATER BOARD LOSES THREE LONG TIME EMPLOYEES

With deep regret and best wishes for the future, the Montana Water Resources Board accepted the resignations of three long time employees, all from the Board's engineering division. Effective July first were the resignations of Don Sullivan, acting chief engineer, John Owens, office engineer, and Carl Baumbauer, chief detailer in the engineering division. All three were well known for their work on Board projects and efforts toward continuing water development and conservation in the state.

HEARINGS HELD ON PROPOSED EVALUATION PROCEDURES

A series of hearings to solicit views and opinions on proposed new procedures for the evaluation of federal water projects is presently being held by the Federal Water Resources Council. Testimony by Montana was presented in Portland, Oregon on Aug. 11, and in Omaha, Nebraska on Aug. 14 by the Water Resources Board. Director Everett Darlinton, testified in Portland and then remained for a Water Management Committee meeting in connection with the Columbia North-Pacific Study. Tom McNulty, administrative assistant to Mr. Darlinton, presented material at the Omaha hearing.

The proposed procedeures suggest that federal water projects be oriented to four national objectives; (1) national income, (2) regional development, (3) Environmental enhancement, and (4) Well-being of the people. Programs and projects would be evaluated in a proposed "System of Accounts" which would supposedly measure the program or project in terms of impact and effects on the suggested national objectives. There is serious question, however, on how to quantify several aspects of project effects and the matter of compatibility among measurements and descriptions of project effects and the suggested national objectives.

Under the proposal, secondary benefits to a local area from a project might largely be assigned to the national income objective. From there it would be compared with projects in other areas in terms of effect on national income. Seemingly, the project showing the most gain to national income would be preferable if other effects of the projects in question were nearly equal. A Montana project, for example, might supply a critical water need but have only relatively small secondary benefits accuring to national income while a project elsewhere which might not be as needed in terms of water suply but still show more secondary benefits in national income. Under the proposed evaluation procedures, the Montana project would not appear as favorable as one showing the larger national income effect from secondary benefits.

Testimony presented by the Water Resources Board pointed out that the proposed procedures appeared to be too population oriented. This, of course, places Montana at a disadvantage, especially where surrounding population in a project area could conceivably constitute much contribution in secondary benefit income accounting.

Another related factor pointed out was that the proposed calculation procedures have implications concerning interbasin tranfers. These would not be in the best interest of Montana or the Northwest.

MONTANA TO ATTEND NATIONAL WATER COMMISSION FALL HEARINGS

The National Water Commission, authorized by Congress and named by the President, has scheduled a series of regional public hearings this fall as part of its five-year study. The Commission hopes to provide comprehensive background for future U.S. water activity. Montana will attend at Portland, Aug. 29 and Denver, Sept. 26.

Douglas G. Smith assumed his duties as director of the Montana Water Resources Board Sept. 2. Smith, 37, was appointed by Governor Forrest H. Anderson to succeed director Everett V. Darlinton who resigned.

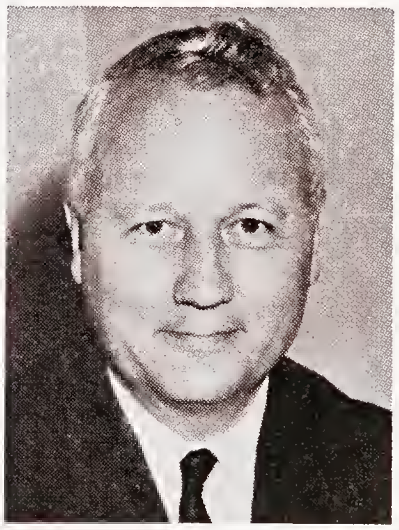
Smith served as Montana's executive director of the Agricultural Stabilization and Conservation Service office in Bozeman from 1963 until July of this year.

A native of Lewistown, he was graduated from Stanford High School and holds a bachelor of science degree from Montana State University in agricultural education.

He also served as County Agent in Pondera, Liberty and Hill County and as a farmer fieldman for the ASCS before assuming the Bozeman position.

In 1961, Smith led a "People-to-People" tour of South American countries. His group consisted of 30 farmers and ranchers from Montana, Wyoming and North Dakota. He also sponsored and trained a land and range judging team of 4-H members from Liberty County. The team received first place in Montana competition in 1960 and 1961 and placed high in the International Range and Land Judging contest in Oklahoma City, Oklahoma in 1961. Smith was also selected as Montana's County Agent to participate in the 1962 Dow Study Tour. As the state's participant in the tour, Smith spent a month observing various agricultural methods, advances and technology throughout a five-state western region.

Smith is a U.S. Marine Corps Veteran and member of the VFW, Elks and Kiwanis. His military citations include the Purple Heart, Korean Presidential Unit Citation, Good Conduct Medal, American Defense Medal, Korean Service Medal, United Nations Service Medal and four battle stars.



Everett V. Darlinton, who headed the Water Resources Board for two years, announced his resignation to a meeting of the Board.

Before becoming director of the Board in July, 1967, Darlinton had been state engineer and had acted as director of the old State Planning Board—now the State Department of Planning and Economic Development. He was assistant director of the Water Resources Board from the time it was combined with the state engineer's office in 1955 until becoming director.

A native of Bozeman, Darlinton holds a degree in industrial engineering from Montana State University. He was a test engineer on electronic weapons for General Electric Co. in New York State 1943-52. He also has business experience in Bozeman.

In announcing his resignation, Darlinton told Governor Forrest H. Anderson "The burdens of this important office are becoming increasingly great and I believe that a new approach to the many problems our agency is continually encountering would be best for all concerned."

Anderson accepted Darlinton's resignation with regret and expressed the hope that Darlinton would remain in state service.

TENTATIVE MISSOURI BASIN PLAN UNVEILED AT BILLINGS MEETING

The regular quarterly meeting of the Missouri Basin Inter-Agency Committee (MBIAC) was held in Billings June 10, 11, and 12. Meeting sites for the joint State-Federal water study and planning organization rotate throughout the 10 state Missouri River Basin area. A public information meeting on the progress and plan of the Missouri Basin Study was held following the regular business session.

Featured topics discussed during the meeting were the Big Horn Canyon National Recreation Area, Resource Development on the Crow Reservation, Industrial Views on Water Needs on Wyoming and Montana Coal Lands, Coordinated Resource Management, and Stream Bank Erosion. Everett Darlinton, Montana Water Resources Board director discussed Montana's Water Resources Program.

Mr. Darlinton reviewed progress on the Montana Water Plan and expressed the belief that small upstream reservoirs hold much promise for future water development in the state. "Such reservoirs would catch much of our spring flood water near their source" said Darlinton. He continued that the water would then be available for use later in the year. To emphasize his point, Darlinton commented that over one-half of the yearly flow of our streams occurs during the three months of May, June, and July.

The public information meeting was kicked off by a review of the MBIAC organization and purpose. The MBIAC is composed of seven federal agencies; the Dept. of Agriculture, Army, Commerce, HEW, Interior, Labor, and the FPC. The 10 state members are Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming.

Preliminary analysis (data subject to change and revision) show that basin productivity yields will increase from a current index of 100 to an average of 128 by 1980, 150 by 2000, and 168 by 2020, for major crops, range and pasture. Assisting the MBIAC in the agricultural analysis were several experiment stations at various land grant colleges in the basin (including Montana State University) and the Great Plains Agricultural Council. These projections considered improved production technology and practices and the continued application and improvement of soil and water conservation.

Agricultural production requirements expected to be placed on the Missouri Basin's agriculture resources are summarized in the following table:

Estimated Agricultural Production Requirements for the Missouri Basin as a percent of 1960 Production

Type of Requirement

Year	Meat Requirement	Food & Feed Grain Req.
1980	146	161
2000	203	219
2020	285	286

The stated MBIAC objective is to formulate a framework program for the best use of water and related land resources to guide future resource development within the Basin. The role of the states was portrayed to encompass seven areas; (1) stewardship of state resources, (2) promotion of major objectives, (3) establishment of rights and jurisdiction, (4) assistance to local interests, (5) administration of programs, (6) setting standards, and (7) cooperation with federal agencies.

Initial findings and data presented by the MBIAC included a 1960 basin population of 7.8 million persons which was 4.5% of the nations population. The basin's population was projected to reach 10.4 million in 1980, 14.3 million at the turn of the century and 20.1 million by 2020. This amounts to an increase of one-third by 1980, almost a doubling of present population at the century's turn and an increase of 15.8 percenet from the present by 2020.

Relevant population data for the Missouri Basin is summarized in the following table:

Missouri Basin Population Data

Year	Population	Persons Per Sq. Mile
1960	7,931,103	15.0
1980	10,433,000	19.7
2000	14,345,000	27.1
2020	20,060,000	37.9

Agriculture, the tradionally predominant economic sector of the basin presently utilizes in some way approximately 95% of the basins land area. Missouri Basin agriculture currently produces over one-third of the nation's wheat and one-fourth of the nation's cattle, calves, hogs and sheep. The basin also accounts for over twenty percent of the national production of barley, sorghum, corn and oats and thirty percent of national sugar beet production. This production was found to be achieved with only eleven percent of the nation's agricultural employees.

In order to meet these requirements it is expected that there will be a steady decline (or conversely an increasing utilization) of the basin's presently estimated 8.5 million acres of idle capacity. However, not all of that land seems destined for agricultural production. The study has initially estimated that 4.8 million acres of land will be required for highways, airports, defense and what is loosely termed urban buildup.

Tentatively, what the MBIAC plan indicates is that agricultural requirements could be met in spite of decreasing agricultural employment and land. At its present stage, the MBIAC Plan shows agricultural acreage decreasing 13,128,000 acres by thee year 2020; 3.9 million of which will be lost by 1980.

To meet the agricultural requirements and other needs (i.e. flood control, recreation, scenic rivers, municipal and industrial water, etc.) the MBIAC Plan has, on a preliminary basis estimated developments will be needed which will require construction investments of 7 billion dollars by 1980, and a total of 21 billion dollars by 2020.

NEW DISTRICT CHIEF FOR U. S. GEOLOGICAL SURVEY

George M. Pike, Helena, has been appointed District Chief of the U. S. Geological Survey, Water Resources Division replacing Charles W. Lane who will assume the duties of Chief of the Survey's Kansas District in Lawrence, Kansas, on July 1.

Mr. Pike is a 1950 graduate of the University of North Dakota where he received a B.S. degree in Civil Engineering. Prior to coming to Montana, he was assigned to Geological Survey offices in Bismarck and Grand Forks where he worked on surface water investigation in North Dakota and Minnesota. He moved to Montana in 1965 and was appointed Assistant District Engineer of the Survey's former Surface Water Branch. In 1966 upon the reorganization of the Geological Survey's branch structure into a single division that administratively combined the functions of the former surface water, ground water, and quality of water branches, Mr. Pike became Assistant District Chief of the reorganized office.

Mr. Lane is a 1948 graduate of Kansas State University and prior to his service in Montana was assigned to Geological Survey offices in Iowa City, Iowa and Lawrence, Kansas where he served as a specialist in ground-water investigations. In 1962, he was appointed District Geologist of the Survey's former Ground Water Branch in Montana with headquarters in Billings. Upon reorganization of the Survey's Water Resources Division in 1966, Mr. Lane became District Chief with headquarters in Helena where he has served until the present time.

The Montana district of the Survey's Water Resources Division, in cooperation with many State and Federal agencies having a district interest in water of the State, conducts investigations of the surface-water, ground-water, and water-quality resources of Montana. The district is also responsible for stream-flow investigations in Yellowstone Park and the measurement and division of the water of the St. Mary and Milk Rivers between the United States and Canada.

SMITH RIVER — NEW RECREATIONAL WATERWAY

A tentative designation by the Fish and Game Dept. last spring added a portion of the Smith River to the State's Recreational Waterway System. The Smith River section is the fifth area to be brought into the Fish and Game Department's Recreational Waterways System.

The portion of the Smith joining the Recreational Waterways System runs approximately from the Smith River forks near White Sulphur Springs in Meagher County, to the mouth of Hound Creek in Cascade County, an area known as the Smith River Canyon. It is a rugged scenic area. The river itself is classified by the Fish and Game Dept. as mostly a Class II stream, one having state-wide fishing value. Trout up to nine pounds have been taken in the area. Due to its rugged inaccessibility in many reaches, float fishing is very popular in the area.

A resolution by the Montana House of Representatives last session called for the Council on Natural Resources and Development to study the possibility of establishing a state park in the area. Members of the Council will contribute their special expertise to the study. The Water Resources Board will be involved in studying water rights and water availability and streamflow augmentation in the area. Chairman is Board Director, Everett Darlinton. Darlinton says the park study must be reported to the Governor by December 1, 1970. Designation of streams for study and inclusion in the Recreational Waterway System is being undertaken by the State Fish and Game Commission. The concept has been incorporated in the state recreation planning by that commission its Fish and Game Dept. The Statewide Comprehensive Water Plan being prepared by the Water Board will take into consideration Recreational Waterways as part of the state's complete water picture.

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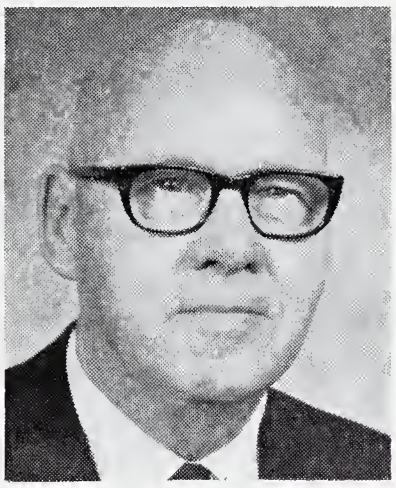
MONTANA WATER RESOURCES BOARD

Vol. 2—No. 1 NEWSLETTER April, 1969

BOARD MEMBERS

Homer C. Bailey



Everett Redeen

Governor Forrest H. Anderson named as new members of the Water Resources Board two men who have long been interested in and closely associated with water conservation and development.

The new Board members are Everett Redeen of Forsyth who is engaged in the ranching and insurance business and Homer C. Bailey who is a farmer-rancher at Corvallis.

Mr. Redeen, a one time school teacher and former Rosebud County School Superintendent, is a supervisor in his local soil and water conservation district, and Community Committeeman of the Rosebud County Agricultural Stabilization Conservation Service.

Mr. Bailey is a former Community Chairman of the area Agricultural Stabilization Conservation Service; he is Vice President of the Corvallis Canal and Water Company, and President of the Humble Drainage District, Ravalli County. He is also past President of the Western Montana Beet Growers Association.

Both men are familiar with the many problems associated with water conservation and development. They replace former Board Members Sid Kurth, Billings attorney, and Donald L. Delaney, prominent Missoula businessman, whose terms expired in January.

Governor Anderson, Chairman of the Board, and Everett V. Darlinton, Director, are exofficio Board members; other members are Wilbur White, Twodot, Vice Chairman and Secretary; Clyde Hawks, St. Xavier; and Henry Sawtell, Miles City.

WATER RELATED LEGISLATION

Montana's 1969 Legislature approved more than a dozen Bills related to water problems as well as five resolutions pertaining to water problems. They were signed by Governor Forrest H. Anderson, and a brief resume' of them follows:

Senate Bills

SB 19—Requires all persons introducing a new or increased source of sewage industrial waste or other wastes . . . into waters and tributaries classified as "A—open, D—1" or higher by the State Water Pollution Control Council to install and maintain the highest and best degree of treatment works necessary to maintain the classification existing prior to issuance of a permit.

SB 67—A Water Conservancy District Bill with the Water Resources Board as the investigating agency.

SB 82—Requires the appointment of a hydrogeologist from the Montana Bureau of Mines and Geology as a nonvoting member and technical advisor to the State Water Well Contractors Examining Board.

SB 291—Increases the number of participating State agencies from 12 to 16 on the Interdepartmental Advisory Council for Natural Resources and Development. It also provides for meeting of the Council every 60 days with written reports by all agencies on water problems. The Director of the Water Resources Board will be the permanent Chairman of the Council.

SB 292—Provides for the appointment by the Board of Education of a certified professional geologist as State Geologist and Associate Director of the Montana Bureau of Mines and Geology.

SB 315—The Dredge Mining Regulation and Land Preservation Act provides that dredge mining reclamation shall be regulated by the State Board of Health and shall include recreation and grazing uses as well as preventing pollution of streams.

House Bills

HB 179—An Act deleting by amendment provisions that the four appointed members of the State Soil Conservation Committee must be farmers. The Act also limits to 1½ mills the assessment on real property within a Soil and Water District for operations of the District.

WATER RESOURCES BOARD
Governor Forrest H. Anderson*
Chairman
Wilbur White, Twodot
Vice Chairman and Secretary
Everett V. Darlinton*
Director
Homer C. Bailey, Corvallis
Clyde Hawks, St. Xavier
Everett Redeen, Forsyth
H. J. Sawtell, Miles City
*ex officio

This Newsletter is published Quarterly by the
THE MONTANA WATER RESOURCES BOARD
Mitchell Building, Helena, Montana 59601

Anyone wishing to submit material for publication is invited to do so. The Board reserves the right to edit all material to conform with space limitations. This publication is distributed free of charge, and names will be placed on mailing list upon request.

Edited by Norman J. Brown

(Continued from Page 1)

HB 247—An Act requiring the State Highway Commission whenever it acquires irrigable land to provide payment equal to the annual increase of operation and maintenance costs on the remaining lands under irrigation in the district.

HB 265—Provides for the formation of a weed control district in every county.

HB 328—Authorizes County Commissioners to create special improvement districts for the establishment of safety devices on open ditches.

HB 355—Authorizes cities and towns to require protective devices around any open ditch carrying water. The Act also authorizes cities and towns to create special improvement ditches in such situations and excludes town councils from responsibility of maintaining the devices.

HB 450—Reserves unappropriated water in certain streams for fishing and wildlife purposes and any filings for this purpose must be reviewed by the Water Resources Board; State Fish and Game Commission; State Soil Conservation Committee; and the State Board of Health.

HB 458—Reduces the fee charged by the Water Resources Board to operators engaged in weather modification activities (cloud seeding) in Montana from 1½ to 1 percent.

HB 499—Authorizes County Water and Sewer Districts to incur a bonded indebtedness when a majority of votes cast at an election are in approval.

Senate Joint Resolutions

SJR 17—Acknowledges that the States of Montana, North and South Dakota and Wyoming are now engaged in active planning for development of water and related resources to achieve maximum resources potential.

SJR 18—Provides that the Water Resources Board continue to keep the State Legislative Council informed of activities pertaining to the allocation of Montana water to be used for the development of coal resources.

House Joint Resolutions

HJR 12—Provides that the Interdepartmental Advisory Council for Natural Resources and Development shall study the feasibility of acquiring State lands in Smith River Canyon for the purpose of establishing a recreational park.

HJR 21—Urges greater cooperation and consideration by the U. S. Corps of Army Engineers for the fish and wildlife resources of Montana during construction and operation of their porjects.

House Resolution

HR 19—Requests the Water Resources Board to conduct a study on the development of a modern water code.

THE UTILIZATION OF GROUNDWATER FOR THE SECONDARY RECOVERY OF PETROLEUM

By A. J. Mancini, CPG*
Water Resources Board Geologist

Groundwater is used extensively in Montana for the secondary recovery of petroleum. Millions of gallons of groundwater are used each year for this purpose, and the amount will increase during the next several years due to the economic development of crude oil reserves in the state. Waterflooding is recognized as a major contributor to the conservation of this natural resource. Almost thirty percent of Montana's annual crude oil production results from waterflood projects.

Why is groundwater used for this purpose?

The key to any waterflood project is an adequate supply of water. All of the Montana projects presently are using groundwater (both "fresh" and "saline"). Several reasons have been given for preferring the use of groundwater over the use of surface water:

(1) surface water can convey air, bacteria, and suspended solids into the system which can cause serious problems and are costly to remove;

(2) groundwater usually is available in sufficient quantity and at reasonable cost near the place of intended use;

(3) the quality of groundwater, including the temperature, remains constant.

How is groundwater used?

Water is obtained from wells and pumped through a gathering system to a storage area where it is used to supplement the supply of produced water. Produced water is pumped out of the ground with the oil and separated from it at the tank battery. This water then moves through pipelines to the central storage area. Groundwater is used to supplement the amount of water produced with the oil as this water is generally used to repressure the oil reservoir also. During oil-producing operations, the water-cut

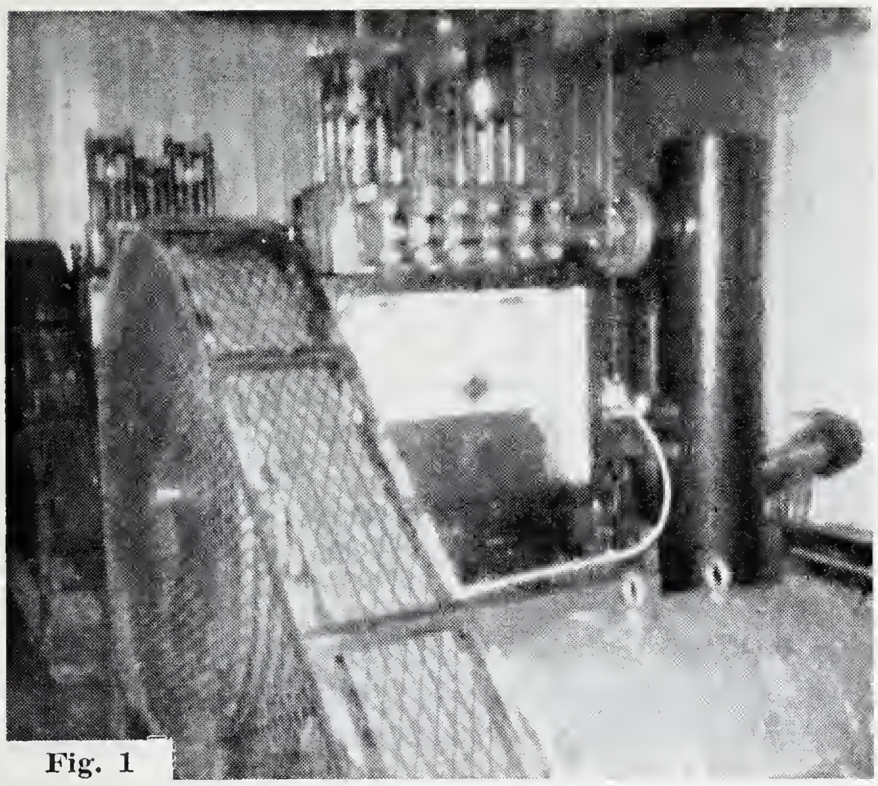


Fig. 1

Waterflood injection pump, Big Wall oil field in Central Montana. Approx. 4,700 bbls. of produced water are injected daily. —(Photos courtesy Mont. Oil & Gas Consv. Com).

(amount of water produced with the oil) will increase with time. The amount of groundwater needed will reach a peak and then decline with time.

From the central storage area the water is piped to strategically located injection stations where the water is pumped down-hole and into the oil-bearing strata. Crude oil does not occur in "lakes" underground, but instead occupies small holes (pores) between grains of sand which have been cemented together at contact points by natural processes occurring throughout millions of years of past geologic time. Oil is also found in small pockets which developed in carbonate rocks by solution or other natural processes. The small openings in sandstone and limestone/dolomite can be completely filled with water, in which case there would not be an oil field. When these openings are filled with oil and water, an oil field may be developed. In order for these openings to be developed into an oil field, they must be connected to each other through the rock or cementing material. The degree of interconnection is "permeability" and fluid moves through the confining rock because of permeability. This same permeability allows the injected water to displace oil and "push" it to a place where it can be more efficiently recovered.

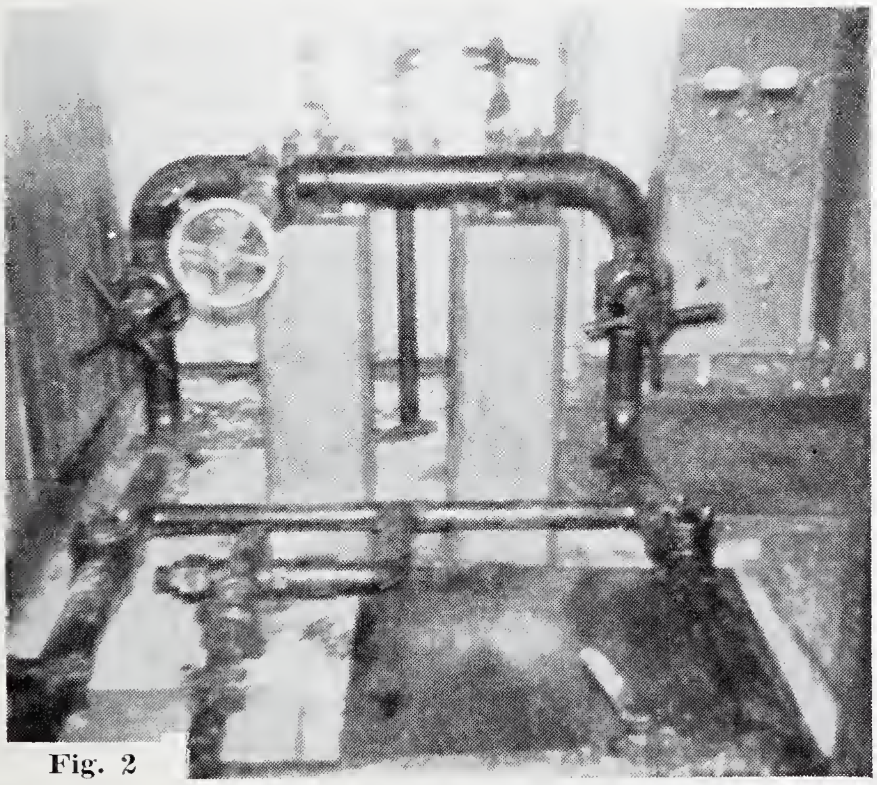


Fig. 2

Header system of injection well. Big Wall oil field. Water is injected under pressure to displace oil from the rock.

From what aquifers is this groundwater produced?

The groundwater used in the secondary recovery of oil is pumped mostly from aquifers too deep for any other use, and is water unfit for any but industrial use without costly pretreatment. There are exceptions to this, the most significant of which is the waterflood in eastern Montana which uses water from the same aquifer that provides water for domestic, stock, and municipal purposes.

Are there any restrictions to the use of groundwater for this purpose?

Groundwater can be appropriated for the secondary recovery of oil inasmuch as this is a beneficial use. If the source of groundwater for this purpose is also the source of water for domestic, stock, and other uses, a controversy may develop and restrictions can be imposed. A controlled groundwater area can be established, as has been done by the Montana Water Resources Board in eastern Montana. This was done because a controversy developed over the use of Hell Creek-Fox Hills water and withdrawals from this aquifer have been "frozen."

A recent court decision brought attention to the provision of the Groundwater Code which stipulates that a right to the use of groundwater depends upon beneficial use. The court decided that an oil company operating in north-central Montana could use groundwater for the secondary recovery of oil over the objections of a lessor, because the lessor had never established a right by previous beneficial use.

*CPG—Certified Professional Geologist.

MEANDERING THOUGHTS ON COOL, CLEAR WATER

By George Darrow, CPG*

Former Billings Legislator

We are all engaged in studying the uses and effects of water in one way or another. It is the ubiquitous which, internally and externally, enters our lives almost hourly. In collective groups, we deal with water as a natural resource. The Montana Water Resources Board works with water as the one natural substance controlled and administered by the state. But, really, what is this substance? Isn't it much more than a mere commodity in our workday world?

I want to take a monent to share with you some of the fascinating wonders of water. It is unique. It is one of the few natural liquids on our planet, and certainly the most abundant of these. It covers three-fourths of the earth's surface. "Water is life. Without water there is no life as we know it. When we talk about water, we are talking about the most important single substance on the face of the earth." Water is the mother element that shelters and brings into being nine-tenths of everything alive. Two-thirds of the

(Continued on Page 4)

human body consists of water. "What are men but little detached ponds—a way that water has of going about beyond the reach of rivers."

Water is almost the only substance that expands or becomes lighter when it cools from a liquid to a solid. When water freezes and becomes ice, it floats. What would happen if our rivers and lakes froze from the bottom up? Would they ever thaw or would we have caps which extended halfway to the equator?

When water freezes, the ice crystals contain no impurities. Pack ice in the Artic Ocean is pure, fresh water. Similarly when water evaporates, it leaves all its impurities behind. Thus, as water moves through the hydrologic cycle from ocean to atmosphere, and from liquid to solid it is automatically purified. Our continued survival on earth would not be possible without this natural purification system.

Further, when rain or snow returns to earth it condenses around airborne dust specks and pollution particles to cleanse the atmosphere. These particles are then returned to the soil or surface water before the water again purifies itself and moves on. The residual pollution remains with the land.

Water is the universal solvent. No other substance on earth has the ability to dissolve so many things. About half the minerals found in the earth's crust also occur dissolved in ocean water. All of the food we eat must be dissolved before it is digested. No life process in nature can function without water. Plant roots must obtain their soil nutrients in solution. Unfortunately, DDT and other hard pesticides are not water soluable.

Because of its high latent heat, water changing from liquid to vapor can absorb large amounts of heat without changing temperature itself. This makes it possible for us to maintain our body temperature through perspiration on hot summer days. When freezing or condensing, water gives off heat thus moderating the climate near oceans and large lakes.

Water molucules have an extraordinary cohesion which we refer to as surface tension. This causes water to rise in tiny capillary tubes against the force of gravity. Without this unique property, tall trees could not exist. And because of this property, much oil remains underground in oil fields, locked in by the water blocking the tiny capillary pore spaces through which it must move.

All of the water that ever existed on this planet is in existence today. The quantity of water we have today is no more and no less than there was when our ancestors were living in caves 25,000 years ago. The water molecules in Cleopatra's bath, or the sweat of a Neolithic ancestor, might be the same ones you drank tonight. The distribution of water over the earth is constantly changing, but the total amount is unchanged.

The hydrologic cycle, is powered by more energy in a single day than man has generated throughout his history. Nature's water distribution system, coupled with water's unique ability to change readily from solid, to liquid, to vapor and back again, within a moderate range of 180° F. from freezing to boiling, is the basis of life on earth.

Now, a brief comment on water in the total environment. We have reviewed some of the unique qualities that make water such a precious substance in the inventory of planetary resources. But what of the relationship between water and other resources?

Water is the companion resource of every other resource. It makes possible the productivity of all other resources. Soil is nothing but inert mineral matter without water. Land itself has little value unless water exists on it, or can be brought to it. No other mineral or product of the land can be produced and processed without the use of water at some stage of production.

Often the availability of water is the limiting factor in determining the opportunities for economic growth and development. In the absence of ground water, the availability of municipal water service controls the direction and extent of urban growth. Where and how the coal resources of southeastern Montana are used will be determined by the availability of water. The allocation of water resources for specific purposes will determine the economic character of a region for generations.

Water is a medium of transport. It is the transport system for all of the dissolved nutrients which sustain life in both plants and animals. Most of the world's large cities are located where navigable rivers empty into the ocean. A major portion of the world's population lives in close proximity to the ocean.

In parallel with the world-wide pattern of human settlement, most of Montana's cities and concentrations of people are located adjacent to water. Water determines the location of population centers. In Montana, this means in the mountain valleys and along the river valleys. Unavoidably, when we concentrate people in these localities we also concentrate their waste products. I think you can see how the need of our settlements to be in close proximity to a water source has led to our present pollution problems.

When the original river bank settlements grew into bustling urban centers, we continued our pattern or development on the river bank and along the valley floors. Today, we have people and industry, highways and railways, suburbs and shopping centers jammed together, and all piled on top of the state's best agricultural land in a few favored valley locations. Unfortunately, these same valleys are afflicted with pockets of stagnant air and frequent smog producing temperature inversions. Once again we see that not only are water resources interwoven with other resources, but even the problems of water pollution are interwoven with other pollution problems as interrelated elements of the total environment.

Recreation without water is almost unthinkable. Does your family ever go camping or picnicking on a dusty sagebrush flat? Outdoor recreation means water. We slide on it summer and winter, swim in it, fish in it. boat over it, snowmobile through it and prefer to drive or walk by it. How many Montana families depend on the reach of the river below your city? Or is your recreation, not to mention your health, in the hands of an upstream community? What does the water quality of Montana rivers mean to you? To the economy of our state?

This may be a meandering discussion, but I have found that it is nearly impossible to keep any consideration of water restricted to water alone. As the world's most important substance, it keeps getting tangled up wih everything else. Each of you have found ths to be true in your own experience. It is equally true of the responsibilities for water planning and development which have been assigned to the Montana Water Resources Board. Our lives, our livelihood and our leisure are all dependent upon the continued availability of an adequate supply of water. It is important for every Montanan to follow closely the preparation by the Water Resources Board of the State Water Plan and participate in the planning process.

*CPG—Certified Professional Geologist.

MONTANA YOUTH CONFERENCE ON CONSERVATION

The Montana Water Resources Board will again participate in the Montana Youth Conference on Conservation which is being held this year on April 26 at Carroll College, Helena. The Water Board will sponsor eight 4-H Club youth leaders participating in the conference.

The Montana Youth Conference is sponsored by the Montana Conservation Council in cooperation with the Montana Federation of Garden Clubs and the Montana Federation of Women's Clubs.

Invitations to attend the conference have been extended to high school, college and university young people interested in Montana's natural resources.

Local arrangements for the conference are being handled by Dave Wedum, Montana Fish and Game Department, with Miss Francis Hickman, Helena High School, assisting. Among others named to the arrangements committee was Mel McBeath, Water Board Assistant Project Supervisor, Engineering Division.

Discussions will cover various areas of conservation including legislation, range, soil and water resources, recreation, beautification, quality, environment, careers in conservation, and community action.

Conference speakers will include faculty members of the Montana University System and representatives of the U. S. Soil Conservation Service, Office of the State Forester, and the U. S. Forest Service.

STREAMFLOW INVESTIGATIONS IN MONTANA

By C. W. Lane* and G. M. Pike**

The Geological Survey began the collection of stream flow records in Montana on an intermittent basis in 1890, utilizing the services of Montana State College and the Montana Experiment Station. The first financial cooperation with the State began in 1911. With the abolition of the State Engineer's office in 1965, the State Water Conservation Board carried on the program. With the reorganization and creation of the Montana Water Resources Board in 1967, that agency assumed responsibility for carrying on the cooperative streamflow program which is the core of the long-term hydrologic data collection network in Montana. Substantial increases in the Federally supported part of the stream gaging program resulted from international water problems on the St. Mary and Milk Rivers that began about 1916. Further expansion of the program resulted from the Corps of Engineers' investigations that began in 1928, and investigations that started in 1945 under the Department of Interior's Missouri River Basin program for development of the water and related land resources of the basin. The program has remained reasonably stable in recent years with slow expansion to meet principally the needs of Federal water agencies balanced by losses from the network owing to restricted financing of State programs.

There has been a strong tendency in the past to select for hydrologic measurement only those features that seem basic in the light of present practical interest. Crises such as floods, drouths, or pollution create brief and often localized interest in water and its disposition or conservation. Inevitably, the interests and the programs that they stimulate change as a result of a more urgent problem, either man-made or from a succeeding crisis. As a result, facts generally follow rather than precede the problem they seek to solve. This type of hydrologic data collection results largely from methods of financing. It is normally easier for a public agency to finance data collection at a location where there is an immediate problem, than at a location where there may be a problem in future years. The crisis or brush fire approach to hydrologic data collection leads to spotty coverage, leaving large areas where less urgent problems are existent or perhaps unknown. The deficiencies of present basic hydrologic data become readily apparent whenever a new water supply, irrigation, flood-control, or waste disposal project is planned.

Most of the streamflow or surface-water programs conducted in Montana by the Geological Survey are of the data-collection type, as cooperative support by State and Federal agencies is generally aimed at project planning and current management of water supplies. It can be expected that increased emphasis on the economic importance of water, water quality, the conjunctive use of surface and ground water, and water planning activities of neighboring states, will lead to analytical or interpretive programs.

The Montana district of the Geological Survey presently operates 210 continuous record streamflow stations both in Montana and adjacent to its borders. Of these stations, 112 primary stations are considered useful in defining historic streamflow data which may be used to predict future flows. The remaining 98 stations are considered to be water management stations which are used primarily in the day-to-day management of Montana's and the nation's water supplies. Examples of management stations are those primarily used: (1) for the operation and regulation of large reservoirs, in connection with irrigation, power generation, and navigation, (2) to compute and apportion the natural flow of streams between Canada and the United States in accordance with existing treaties, and (3) to monitor streamflow in connection with pollution problems. Although water management stations are necessary to permit management of water projects in existence today, in most cases, owing to regulation, they are of little help in predicting flows which might be expected in the future. The prediction of these flows are extremely important if Montana is to continue to develop water for use in Montana. For this work, reliance must be placed upon the 112 primary stations in the hydrologic network.

The cooperative program with the Montana Water Resources Board provides support for most of the present primary network of streamflow stations in Montana. A part of the Water Board program is also associated with the management of water supplies for irrigation projects constructed by that agency. The Board is also responsible for providing matching support, along with the Wyoming State Engineer, for gaging stations operated for the Yellowstone River Compact Commission. Demands for industrial water supply in southeastern Montana will probably require expansion of this program in the near future.

The cooperative water resources programs with the Water Resources Board, the Fish and Game Commission, the Highway Commission and the Montana State University suuport about 27 percent of the surface water work being done by the Geological Survey in Montana today. The remaining 73 percent of the surface water programs are financed by Federal water agencies, or licensees of the Federal Power Commission. The Federal programs are designed to serve the operational and planning needs of the various Federal agencies. Although the Federal programs add greatly to the overall knowledge of the hydrologic environment of Montana, it is the State cooperative programs which must be depended upon to generate the hydrologic data which is so necessary for the future planning and use of Montana's water resources.

One of the areas where more hydrologic data is needed is additional stream-flow stations to reinforce the present primary network in Montana. The average density of this network is about one-half of what is ordinarily considered adequate to define streamflow characteristics. It is not financially feasible to locate a streamflow station at each point where data is needed. However, the primary network should be of sufficient density to permit transfer of data from the point of measurement to the point of need. Additional stations to define the streamflow characteristics of the intermittent prairie streams of eastern Montana are especially needed. New development on some streams in this part of the state is being retarded because of lack of data. More stations are also needed to define the water yield from high elevation water sheds.

Another area that will require more streamflow information in the near future is that associated with the monitoring of water quality. Policing of the recently adopted water quality standards by State and Federal officials to enforce the water polution regulations will make new demands on the already strained budgets for acquiring water data.

Meaningful streamflow records and other similar hydrologic data cannot be collected in a short period of time. Many years of record representing a wide variety of environmental conditions are necessary to adequately define the hydrologic characteristics of a stream, if reliable predictions of this stream's future behavior are to be made. The prediction of stream behavior is the information water planners and managers must have. If these needs are to be met, serious consideration must be given to programs which will provide the planners of tomorrow with the answers they will require.

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*C. W. Lane, District Chief, Water Resources Division, U. S. Geological Survey.

**G. M. Pike, Ass't. District Chief, Water Resources Division,U. S. G.S.

OBSERVATIONS ON WATER RESOURCES PROBLEMS

William H. Buckley, Executive Secretary
Water Resources Research Institute
Oregon State University

Editor's Note: Inasmuch as the Montana Water Resources Board is presently preparing a comprehensive State Water Plan, the Board is interested in the water planning work being carried on by neighboring states.

What are some of the problems of water resource development in the Pacific Northwest? It is safe to say that many of the problems noted are of equal concern to most of our neighboring states.

In Oregon, studies are underway to contribute basic information to the "Ultimate Needs Study" of the State Water Resources Board. Soil maps are being prepared of areas with a potential for irrigation and the water requirements project through the year 2020. Water requirements for the food processing industry are also being calculated. There are a number of projects which seek basic data regarding the ecology of fish and aquatic insects. Especially important is the blending of skills of the economist and lawyer to conduct a long-range program to evaluate Oregon Water law management institutions. A start has been made to delineate the economic consequences of water diversion from one basin to another.

Needed, most urgently, is increased emphasis on the socio-economic and cultural factors in water resources planning and development. What would be the effect on a particular community of a proposed dam, or recreation area, or irrigation project? How do you corrdinate water resource planning with other state programs, such as urban regional planning, outdoor recreation planning, landuse planning—and with the outlook for future tax resources? More attention should be paid to the possible use of simulation or systems analysis in river basin development, and, above all, to the formulation of valid alternatives to any proposed construction.

WATER SUPPLY

There is no physical shortage of water in total. During certain periods and in certain places, there is, however difficulty in ensuring the right amount of water for some uses. To develop means of predicting water yield in rivers and streams, the Alsea Watershed was begun in 1957 under the auspices of the Governor's Committee on Natural Resources. Here, on land managed by the U. S. Forest Service and Georgia Pacific Corporation, there is a coordinated search to unveil the various factors which affect stream flow. Only last year, a project was begun to determine the feasibility of causing rainfall along the Oregon coast to fall further inland and augment water supplies. Since agriculture is the largest consumptive user of water, analysis has been initiated of various types of irrigation systems and equipment to seek methods of saving water.

But, this is only scratching the surface. To provide more water, primary research objectives should focus on the reuse or re-cycling of water—in the home, in the city, on the farm, and in industry. In the latter case, substitutes for water in the cooling process need to be investigated. Groundwater probes are conducted and data collected by the U. S. Geological Survey, but thought is required on measures to integrate the groundwater and surface water use. What are the engineering, institutional, legal and economic aspects of such a marriage of sources of supply? Finally, great amounts of water are wasted and extravagantly consumed because of low prices supported by subsidy or hidden taxes Should water be priced? If so, in what way and on what basis?

It is a little difficult to talk about quantity and quality separately. Each has impact on the other. A 2,000-square foot demonstration laboratory, constructed adjacent to the Corvallis (Oregon) sewage treatment plant, has been working on water re-use possibilities. This encompasses devising advance methods of treating domestic sewage so that it will be suitable for other purposes. In the forests, experiments continue to determine the effects of various watershed practices on water quality, on water quantity and biotic resources. Numerous projects are aimed at the influence of man's multiple activities on the ability of fish to survive in Oregon's streams, lakes, and estuaries. The role that herbicides play in pollution is of special interest. Other areas under study are the control of water quality in reservoirs, an appraisal of the present waste disposal policy of the state of Oregon, and stream temperature factors.

An important fundamental to water quality management is continuing intelligence on the nature and extent of all significant pollutants. This is a "must" with respect to agricultural run-off and drainage. We simply do not know enough about this area of pollution. More information is needed about the effect of upstream pollution on reservoir quality; biological, physical, and chemical changes during storage; and outlet structure for optimal use of waters of varying quality. Facts and figures are required on the feasibility of joint efforts to treat area wastes—domestic and industrial. This would involve adjoining municipalities, or an industrial-municipal partnership. Accompanying efforts should be expanded on feasible means to use waste material for other purposes, such as irrigation of crops.

(Editors Note: This article is reproduced from the March issue of the "Mississippi Water News" with permission of the Jackson County Board of Water Commissioners.)

"BURIED TREASURE"

About 1,000 U. S. communities had "water emergencies" in 1966. Our nation used over 300 billion gallons of water per day in 1965. Projections show that, by 1980, we will be using about 600 billion gallons daily, or 219 trillion gallons of water per year. In the year 2000, we may be using as much as 900 billion gallons per day. At that rate, it would take only 18 years to drain the Great Lakes.

Industry water use is increasing. It takes 600,000 gallons of water to produce a ton of synthetic rubber . . . 140,000 gallons to produce a ton of wool . . . 70,000 gallons to produce a ton of steel . . . and 770 gallons to refine just one barrel of petroleum. Water is used for cooling and cleaning and is essential to our industries.

Farm use of water also is on the increase. Formerly, irrigation was used primarily in arid areas. But now it's used in the Midwest and other areas to insure that crops get proper amounts of water when they need it—not just if it rains at the right time.

In addiion, it has been proved that livestock thrive when water is always available, and sanitation requirements mean use of more water in cleaning up.

Then, at home, more Americans want "extra" bathrooms and showers, automatic dishwashers and clotheswashers, air conditioning, and home swimming pools.

You may be interested in knowing how this country uses its water. Most people assume home consumption is big, but this isn't true. In 1960, when we used 323 billion gallons of water per day, industry used about half, irrigation took over 40 percent and domestic usage accounted for about 7 percent. Experts say that industrial use will be even greater in the years ahead.

The principal cities in the United States were located near what was once an adequate supply of water. But, today, our cities have outgrown their supply of nearby surface water. They've built dams and reservoirs to enlarge their natural supplies. They've even built long pipelines to bring water to highly populated areas, and expensive treatment facilities are used to "clean up" contaminated surface water for use.

Another factor is pollution, which is more serious in terms of domestic water supply than in terms of industrial and agricultural needs. Water which is potable—acceptable for drinking—must be provided to people, while poorer quality water may be used in industry or for irrigation.

Our population problems are so severe that we are spending at least $400 million a year to decontaminate industrial waste, according to Worthington Corporation. It reports estimates ranging from $1 billion to $4 billion a year for the next 10 years just to clean up all industrial waste. And industrial waste, of course, is only one factor in the pollution of our waters.

Still another reason for our water problem is mismanagement, plain and simple.

New York City, for example, uses 1 billion gallons of water per day, according to recent figures. Of this water, it has been estimated that 150 million gallons are lost through leaks in water mains and other inefficiencies. Another 100 million gallons drip away, unused and wasted, in homes and office buildings because of poor plumbing. That's a total of 250 million gallons—¼ of the water usage of New York City—which is being wasted daily. The same factors apply to some extent in all cities throughout the country.

There is another kind of mismanagement, too, and this is one of the most important reasons that we're all feeling a "water pinch." This is the underuse of our ground water resources.

Here is the "hydrological cycle" in simplified form. Enough rain and snow falls on the contiental United States each year to cover the entire country with 30 inches or more of water. That's over 4 trillion gallons per day of rainfall in the United States, or seven times our projected need for the year 1980. But—about 70 percent of this water evaporates or is absorbed by plants or trees; the remainder enters into streamflow, either on the surface or in underground aquifers. These aquifers are underground storage areas and channels which contain ground water, our nation's buried treasure.

To put it another way, our proved ground water treasure is 47.5 billion acre feet—a supply that will last the United States 7,900 years at the current rate of depletion. There is about the same amount of water on the earth today as there was thousands of years ago. Most water "uses" do not destroy but simply pollute water. While we're not likely to run out of water, we are likely to run out of unpolluted surface water. That, in fact, is what is happening to us today.

WATER RIGHTS SURVEY

Mr. Everett V. Darlinton, Water Board Director, notes that earlier this month three field crews began a survey of water rights and water uses in Prairie and Dawson Counties. One crew will be headquartered in Terry and the other two crews in Glendive.

Mr. Hans Bille, Supervisor of the Board's Surface Water Rights Division, reports that to date field surveys have been completed in 45 of the State's 56 counties. He also reports that upon completion of the surveys in Prairie and Dawson Counties, which is expected within approximately two months, the field crews will move into Richmond County for a similar survey.

These field surveys, Mr. Darlinton explained, are part of the Water Board's continuing comprehensive water resources survey on a county-by-county basis and they constitute an important element in the Board's preparation of a Comprehensive State Water Plan.

The field crews will make personal contacts with farmers and ranchers to obtain information on their water rights and water uses. This includes the mapping of all irrigated and potentially irrigable lands. Also to be investigated are irrigation systems as well as water storage facilities. In addition, all reservoirs in the counties having a storage capacity of 50 acre-feet or more will be inventoried.

MONTANA WATER PLANNING COMMENDED

The statewide comprehensive water planning work of the Montana Water Resources Board was praised by Harold Wilm, Assistant Director of the Federal Water Resources Council on a visit to Montana last week. Mr. Wilm expressed pleausure with Montana's water planning effort and felt that the State and the Water Board were doing exceptionally well in view of limited personnel and budget.

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TONGUE RIVER CONTRACT SIGNED BY WATER USERS

By E. V. Darlinton, Director
Water Resources Board

On November 27, 1968 the Tongue River Water Users Association signed an amendatory Water Marketing Contract between the Association and the Montana Water Resources Board which provides for sharing Tongue River water among agricultural and industrial users.

On December 5 the Montana Water Resources Board adopted a resolution approving the contract and recommending that the Governor and the State Board of Examiners approve it.

The contract was drawn by Henry Loble of Helena, special counsel for the Board, and Rex Hibbs of Billings, attorney for the Association, after more than two years of negotiations between the two organizations. It provides that farmers and ranchers along the Tongue River from the Water Board's existing reservoir near Decker, to Miles City be given three years commencing September 1, 1968 in which to buy a total of 40,000 acre-feet of water annually from the existing reservoir for agricultural purposes. This amount of water constitutes the firm yield of the reservoir during a long-term drought as determined by the Bechtel Corporation of San Francisco, employed as a consultant to the Board to study this matter. The Board has also determined that lands presently irrigated along the Tongue River require 40,000 acre-feet of stored water annually during a long-term drought. If the Association fails to purchase the entire 40,000 acre-feet within the three-year period, the Board will then release from the reservoir only the amount actually purchased by the Association for agricultural purposes and offer the remainder to industry.

Should a new and much larger reservoir be constructed by the Board on the Tongue River, which would inundate the existing reservoir, the Board would release for agricultural purposes from the new reservoir the amount of water that the Association had become entitled to in the old reservoir, and all water made available solely as a result of constructing the new reservoir would be offered to industry.

WATER RESOURCES BOARD HOLDS MEETINGS THROUGHOUT STATE

During December the Montana Water Resources Board held six public meetings to explain the functions and plans of the Board. The meetings were in Missoula, Bozeman, Billings, Miles City, Glasgow, and Great Falls. Ninety-six persons attended, and although the attendance was generally small, the meetings were considered highly successful because of the interest and participation of both legislators and other active citizens.

The procedure followed at each meeting consisted of an introductory statement by E. V. Darlinton, Director of the Board, which contained a description of the history and a description of each of the Board's functions, an explanation of financing, a list of accomplishments, a description of the proposed program, and a discussion of the proposed budget for the coming biennium. Following this, each representative of the Board's staff, including its Planning Consultant, Dr. George Maxey, was asked to comment and the meeting was then opened for questions from the audience.

Many questions concerned the proposal of the Board to reactivate its construction program and the problems encountered in financing projects on a multiuse basis. These led to discussions of Public Law 566 and the possibilities for cooperative programs between the Board and the U.S. Soil Conservation Service. Discussion of these matters led to the consideration of how recreation and related uses might be able to assume a portion of the project costs.

Another recurring question involved the development of the State Water Plan and related subjects. A number of times the staff was asked how the Legislature might best act in regard to "doing something about the water resources problem?" The answer was that the Legislature might best serve by supporting the planning and construction efforts outlined by the Board.

U. N. ASSISTS POLISH WATER PROJECT

By Dr. George Burke Maxey
Water Resources Board Planning Consultant

(Editor's Note: Dr. Maxey was in Warsaw, Poland, from October 20 to November 2 as a special United Nations

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Edited by Norman J. Brown

(Continued From Page 1)

Consultant to assist the Polish Government in the formulation of a water resources development program for the Vistula River Basin).

In the past year the United Nations has organized a plan to develop the Vistula River Basin system in Poland. This project is to be a pilot study for the ultimate planning and development of water resources in Europe and, as such, has attracted considerable attention throughout the world. As might be expected problems in water resources development in Europe are similar to those in the United States, especially the eastern United States, and the Polish project will also be of substantial interest to planners and developers in this country.

In searching for a suitable type area, U. N. scientists and engineers sought a relatively large river basin with a representative spectrum of uses and problems within or nearly within the boundaries of one nation; this was because the physical and economic problems involved would be little dominated by political differences. At the same time they wanted their work to support a needy country with considerable potential, both human and natural, for significant development.

The Vistula River Basin is one of the few in Europe that fits their criteria. Only about ten percent of the Basin lies outside of Poland. The potential for development is great since all aspects of water resources, especially navigation, flood control, water supply, and water quality control are poorly developed except in a few localities. The principal reason for this is that except for the quarter of a century between World War I and World War II and the 25 or so years since the latter war, Poland was partitioned for more than two centuries with the Lower Vistula in East Prussia (Germany), the Middle Vistula in Russia, and the Upper Basin in Austria-Hungary. In both periods when Poland was unified most of the efforts of the people were diverted to reconstruction of a country devastated by war. Only in the past five or six years has Poland been able to look toward normal planning for future development of her natural resources, including water. The scientific and engineering skills developed during the reconstruction period can well be profitably diverted to such areas as resource developments, and the investment of the United Nations in the Vistula River Basin should indeed be a sound one.

At present Poland has a population of 130,000,000 people in an area somewhat smaller than Montana. The Vistula Basin occupies approximately 60 percent of this area, with headwaters in the Carpathian Mountains and with the mouth of the river in the Baltic Sea. Navigation has long been important but only the lower reaches of the river are controlled for this function. Some navigation occurs in the Upper Vistula although the Middle Vistula is totally uncontrolled.

The Upper Vistula has been strongly contaminated by heavy industries centering around Kracow and based on coal and other mineral deposits of Silesia. The Middle Vistula is virtually unpolluted and the Lower Vistula is only mildly polluted, chiefly by sewage and agricultural activities.

Flood control is poorly developed throughout the river basin and flood damages both to riparian property and to navigation are high. Water supplies dependent on the river are also affected by floods.

Many water supplies in Poland have been obtained from ground-water reservoirs in the past but with increasing development more and more surface water, especially from the Vistula and its tributaries, is being used for industrial and municipal purposes. Orderly development of such supplies requires a controlled river.

The comprehensive planning project of the U. N. now being put into effect is designed to lay the basis for development of the surface and ground waters of the Vistula Basin. Flood control, navigation, and water supply, as well as recreation and water quality control, are all considered in the plan and no structures will be built or other control measures considered that do not answer the demands of a multiple-use program.

It is interesting to see this development, so similar to what we Americans are demanding for our water resources, taking place in Europe, especially in a country like Poland which has such close ties to the United States. It is also gratifying to see the United Nations, acting in its primary role of unifier for the world, supply the wherewithal to allow the Poles to take advantage of American know-how and equipment in this significant development.

WATER USE PRIORITIES

By Representative Mark Etchart

House Resolution No. 20 of the 1967 Legislative Assembly requested that an interim committee of the House of Representatives conduct a study to determine the feasibility and desirability of establishing water use priorities by statute. In addition to myself, Representatives George Darrow (R-Billings), Miles Romney (D-Hamilton), Paul Harlow (D-Thompson Falls), Scott Stratton (R-Great Falls), and Manson Bailey (D-Glasgow), served on the committee.

Following a review of present Montana laws and those of other states, the committee concluded that it is not feasible to set priorities for water uses by statute. Rather, the committee concluded that Montana should adopt an administrative permit system for all **new** water uses. Utilizing this approach, an administrative official would set priorities when permits are issued, but the procedure could be adapted to the varying conditions found in Montana in addition to being flexible enough to allow changes in water uses in the future.

In 1967, a bill was introduced to establish such an administrative permit system. The committee reviewed this bill in detail (House Bill No. 513, 1967 Legislative Assembly), modified the provisions, and met with the heads of a number of State agencies to discuss the modified bill. Following these discussions, a revised draft was prepared and has been mailed to a large number of agencies, private groups, and persons interested in water development for their review. After receipt of their comments, the committee will prepare a final draft bill for introduction in the 1969 session.

The purpose of a modern water code, such as that developed in the bill under consideration, is to give the State a workable tool to use in developing water resources for the maximum benefit of the people of the State. The proposed bill will not in any way affect existing water rights, nor will it change present Montana law of eminent domain. The bill also adheres strictly to present Montana law on the acquisition of a water right—that is, first in time is first in right.

The bill provides that except for certain limited uses, **future** appropriation rights will be acquired by obtaining a permit from a State water administrator. Rights which were acquired before the effective date of this act will remain in full force and effect. Under the permit system proposed, there are two general criteria upon which issuance of a permit to appropriate water depends: first, whether there is unappropriated water available for beneficial use, the use of which will not adversely limit future use or development; and second, whether holders of existing rights will be adversely affected by the proposed appropriation. In other words, a person applying for a permit must intend to use the water for a beneficial purpose and the use cannot damage other users. This bill defines a beneficial use to include fish, wildlife, and recreation.

In granting, denying, or modifying an application for a permit, the administrator must hold a hearing after proper notice to determine whether the application will affect existing rights, and whether the applicant will put the water to a beneficial use. The decision of the administrator is subject to judicial review upon action by any applicant aggrieved or any interested party who may object to the determination of the administrator. It is also the duty of the administrator to compile an inventory of all water rights. This would require him to determine what the existing rights are and their priorities. An existing right means essentially a right to the use of water which is protected under the law as it existed prior to the enactment of this bill.

To determine existing rights, the administrator must consider existing court decrees and any existing administrative inventory. He may also require all appropriators within specified areas, or from specified sources, to file declarations of existing rights within three months after the effective date of the order. The administrator may then make a preliminary determination of existing rights for the area under consideration. Any person aggrieved by this preliminary determination may request an administrative hearing. After completion of all the hearings, the administrator will issue his final determination of existing rights in the area. The order is appealable to the district courts. For existing water rights, costs of any surveys necessary to determine those rights will be borne one-half by the State. The other one-half of the costs will be apportioned among the users involved in the determination. For new appropriations, the costs of any necessary surveys will be borne by the person applying for a permit.

The bill will also allow an appropriator to change his point of diversion, place of use, nature of use, time of use, place of storage, make a seasonal or temporary change, or rotate his use of water if the change does not adversely affect the rights of other persons or the public interest. Persons objecting to any change may file a petition with the administrator stating their objections, and a hearing will be held on the change.

For administrative purposes, the State will be divided into water districts by the administrator. Water commissioners will be appointed by the administrator for each district replacing any commissioners appointed by district courts under present law. The function of the water commissioner is to supervise water distribution in his district. If very close regulation of water distribution is necessary in a district, part-time water commissioners may also be appointed upon application of any interested appropriator in the district.

The bill also establishes a procedure for determining abandonment and forfeiture of existing water rights. Abandonment occurs when an appropriator intends to wholly or partially cease using his right. Failure to use a right for ten successive years is considered prima facie evidence of an intent of abandonment. Under forfeiture, an appropriation right may be lost through non-use for a specified period even though the appropriator did not intend abandonment. If an appropriator ceases to use his right for fifteen successive years, the appropriation right will be deemed to be

(Continued On Page 4)

forfeited. This method recognizes the doctrine that water is a precious commodity which should be utilized to the fullest extent possible.

A system of judicial review is established by the bill. The bill affords appeal to the district courts to any person whose interests may be affected by administrative decisions.

WATER RESOURCES SURVEY

By Hans L. Bille, Survey Supervisor

During the fiscal year July 1, 1968-June 30, 1969, the Water Resources Survey Division of the Montana Water Resources Board plans to complete work and have all of the material available to publish reports on the counties of Liberty, Toole, Glacier, Sanders and Mineral. The field work has been completed in all of these counties and maps and written material completed for the published report of Liberty and Toole Counties. This material for Liberty and Toole counties will be transmitted to the printers by the end of December, 1968. A book covering both Liberty and Toole counties will be available for distribution during the summer of 1969.

The publication covering Valley County, which was surveyed last year, will be available for distribution after the first of the new year. The counties which have been selected for survey next summer, and reports published during the latter part of 1969 and early in 1970, are Prairie, Dawson, and Richland, embracing the balance of the main stem of the Yellowstone River in Montana.

This survey is an integral part of the Water Resources Board's Comprehensive State Water Plan. To date 40 of Montana's 56 counties have been completed and publications are available for all, with the exception of Big Horn, Park, and Yellowstone which are out of print. It is planned by the Water Resources Board to have all of the counties in the State (the remaining 16 counties) surveyed and in published book form by the end of the year 1972.

On December 3, 1968, the Water Resources Survey Division of the Water Resources Board moved their offices from the fourth floor of the Sam W. Mitchell Building, Helena, to their new location at 1336 Helena Avenue. This move was necessitated by our expanded program and increased staff needed to keep abreast of the work.

LAND CLASSIFICATION SURVEY

By Glenn R. Smith, Staff Soils Scientist

The Montana Water Resources Board this year conducted a land classification survey in the Montana portion of the Columbia River Basin. The Board was assisted in this project by the U. S. Bureau of Reclamation. The purpose of this type survey is to locate irrigable land in order to plan for Montana's future water needs. As a result of this survey, it is estimated that more than 1,000,000 acres of land in Montana's portion of the Columbia River Basin have a potential for project planning.

Soil survey information helps in planning the future agricultural, rural, domestic, urban and industrial development of Montana communities. It guides people in using the land intelligently in order to support a growing population. Many people also find soil survey information useful in determining locations of, and construction hazards for, subdivisions, airports, highways, recreation areas and industrial plant sites.

Soil surveys are collections of information pertaining to the physical and chemical nature of the land. The soil scientist observes and maps soil-types in the field, carries soil samples back to the laboratory for analysis, and correlates and records the results of the observations and tests. Using this data, the soils scientist then prepares a comprehensive report and a soils map which become available for public inspection. The soils data can also be used to make interpretations of land capability, irrigability, potential woodland suitability, soil shrink-swell rating and other factors which affect the lands potential development.

The data collected through soil surveys is used for many purposes and is an aid in the economical development of land and water resources. Farmers and ranchers can use "soil facts" very advantageously in the planning and operating of conservation projects. Members of the Extension Service, the University Experiment Stations, and instructors all use "soil facts" in the investigation of management practices and irrigation efficiency. Soil surveys also help to select the species and spacings in reforestation programs, managing timber stands, and controlling erosion during and following timber harvest. Soil survey information is available at various State and Federal agencies.

Last September, following his retirement as State Soils Scientist with the U. S. Soil Conservation Service, Mr. Dave Caulfield became associated with the Water Resources Board as a Soil Scientist Consultant. He is now assisting the Board in a land classification survey of Montana's portion of the Missouri River Basin.

MONTANA WATER DEVELOPMENT ASSOCIATION

The Montana Water Development Association held a two-day meeting in Helena, Montana, November 8 and 9, 1968. A total of 21 resolutions were passed, all pertaining to water development as relates to Montana interest. One resolution passed was in support of Conservancy Districts, or other legislation, "that will enable the local people with the cooperation and assistance of State and Federal resource agencies to construct and finance multi-use water development projects."

Keynote speaker at the two-day session was Dr. George Burke Maxey, nationally known hydrologist and planning consultant to the Montana Water Resources Board, whose topic was, "A Challenge for Action."

"Everyone should have a viewpoint on how to manage water," Dr. Maxey said, "for everyone has a stake in water's future in the State."

Harold Aldrich of Billings, Montana, U. S. Bureau of Reclamation Region 6 Director, said a Bureau study showed there could be as many as 15 synthetic petroleum plants, each with a capacity of 10,000 barrels of petroleum and with 2,500 to 3,000 employees each, if and when the vast coal deposits in eastern Montana are developed for the manufacture of petro-chemical products. He declared that industrial growth is definitely coming to Montana and water for industrial use will be in demand. The question is when.

D. P. Fabrick, veteran water conservationist from Choteau, Montana, stressed that multiple use of water is not a matter of conflicts but rather of management. He urged Montana legislators of the 41st Legislative Assembly to pass a Conservancy District Bill. Mr. Fabrick recalled that in the 1967 Legislature, a Conservancy District Bill (SB6) was passed in the Senate by almost unanimous vote only to be defeated in the House by a small margin.

Through passage of a Conservancy District Bill, Mr. Fabrick noted, new opportunities will be created and Montana can look forward to a new period of water development, safeguarding of adequate quantities of water for use within the State, and establishment of additional permanent State water rights.

Dr. S .L. Groff, Chief, Ground-Water and Fuels Division, of the Montana Bureau of Mines and Geology, Butte, Montana, noted that there is at least 100 times more groundwater in storage in Montana than in all surface waters combined, and without groundwater there probably would be no perennial streams in the State.

Dr. Groff also declared that the coming most new beneficial use for Montana water resources would be "industrial use," and that industry could afford to pay more for water used. He also cited the work of the U. S. Geological Survey in the collection of water data in Montana, and discussed the importance of Montana's vast strippable coal resources (approaching 20 billion tons) and the related occurrence of available surface water for hydrogenation and cooling uses.

Participating in the two-day meeting were representatives from Federal and State agencies, and various organizations interested in water development as well as farmers and ranchers who are members of the Association .

Newly elected officers were: President, Chan Bailey, Manager of the Greenfield Irrigation District, Fairfield; Vice President, Hubert White, President of Townsend Lumber Company, Townsend; Secretary-Treasure, Gib Goodman, Assistant Vice President, First National Bank and Trust Company, Helena.

MONTANA WATER CONGRESS SUPPORTS STATE WATER PLANNING

The Montana Water Congress was established on March 1, 1966 when twenty people met in Billings, Montana, to discuss the "most practical way to promote water resources development" in the State.

The meeting was called by Mayor Willard Frazer of Billings, and Clyde Hawks, of St. Xavier, (a member of the Montana Water Resources Board) acted as Chairman. In addition to discussing some specific projects, a number of persons expressed concern over the apparent lack of a comprehensive endeavor to insure the fullest and best use of Montana water.

The growing interest of other states in the utilization of water now flowing out of Montana and in trans-basin diversions of these waters to other regions had become increasingly evident.

An organization committee was formed and it proposed a Montana Water Congress whose membership would include all known interests in water resources. Recognizing the need for careful study of the complexity, and interrelation of water uses, a steering study committee was proposed. The study committee or sub-committees were to report to the Montana Water Congress for whatever action the entire body would consider appropriate. The recommendations of the interim committee were adopted. The aims of the Water Congress as stated in the By-laws are:

(a) To provide an opportunity for all Montana organizations to join in the general effort to develop and promote a practical program to beneficially use the water resources of the State of Montana.

(b) To provide for the establishment of a common meeting ground for all Montana organizations interested in Montana's water use, agencies of the State and Federal government, and research and information units of the State University System.

(c) To collect, organize, disseminate and promote ideas, and research for ideas in the field of water resources, use and development.

(d) To hold regular meetings especially for the exchange of information and programming for Montana water policy.

(e) To encourage all Montana organizations interested in Montana's water resources to maintain a high degree of activity in each of their respective fields of interest in Montana water development.

(f) To provide a clearing house for coordination between all other Montana groups interested in the use of water for urban, industry, power, recreation, municipal and rural, fish and game and wildlife, and agricultural purposes.

Currently the Water Congress is concentrating on four points: (1) The need for a more detailed inventory of the quantity and quality of our surface water and groundwater, and research in the interest of making the best coordinated use of these resources. (2) The early completion of a basic water plan that will show our potential water needs; a well prepared water plan is highly important in view of the more advanced planning of many of our neighboring States and Provinces. (3) Legislation that will facilitate the organization of groups interested in sponsoring multiple purpose water projects. (4) The very necessary complement is adequate funding of State agencies in carrying out their responsibilities in water resources development.

Ad hoc sub-committees have held meetings in recent months and have studied various items related to water resource planning and utilization. The next committee meeting is scheduled for December 27, 1968 at Jorgenson's Cafe in Helena. A general meeting of the Montana Water Congress is tentatively planned for mid-January, 1969.

WATERFLOOD SECONDARY RECOVERY PROJECTS

Norman J. Beaudry, Executive Secretary

Montana Oil and Gas Conservation Commission

Waterflooding was discovered in the early 1880's and appears to have had its beginning in the accidental flooding of portions of various oil fields. Early in the twentieth century waterflooding had become a frequently employed method of stimulating production in many states in fields where wells almost had ceased to produce. More important, perhaps, it proved that millions of barrels of oil were being abandoned that otherwise could be produced economically by improved waterflooding techniques. Its inception, probably more than any other factor, provided the incentive to study petroleum reservoirs and their behavior.

In the year 1967, Montana's oil production amounted to 34,959,026 barrels. During the last fiscal year the State realized $2,544,562.70 in taxes on the crude oil produced. Of the almost 35,000,000 barrels produced, forty waterflood projects for secondary recovery accounted for more than 13,000,000 barrels valued at approximately $33,000,000.

Oil cannot produce itself. Reservoir energy is needed to expel oil from the rocks in which it is trapped. The available natural energy, such as provided by gas in solution or formation water, will expel only a small amount of the original oil in place. When natural energy has been used up, 40-90% of the oil may still be in the pore spaces of the reservoir rock. The "primary" recovery factor due to natural energy in Montana's oil fields is estimated to be in the range of 7% to 45%, more commonly less than 30%. This means that most of the oil remains in the underground reservoir after the natural energy has dissipated. Even though the life of an oil field can be substantially lengthened by secondary recovery methods, the percentage of additional oil recovered is small. Secondary recovery factors for Montana oil fields are estimated to be from 2% to 21%. The highest combined estimate to date is 57% (this is reported as secondary, inasmuch as a primary estimate has not been made). One of the most difficult problems facing the petroleum industry today is that of increasing the amount of oil recovered from the reservoir rock.

The use of water in recovering oil from underground reservoirs is not an isolated instance but a proven tool in the business of producing oil. There are secondary recovery projects in operation in every major oil-producing state. The present trend is to start these projects before a substantial portion of the natural reservoir energy has been dissipated. Not every oil field responds to waterflooding—a field having a solution-gas drive is the most feasible for this method. Usually a pilot-flood will be installed, and if proven feasible will be followed by a full-scale flood. Water injected underground provides artificial energy when the native energy has been exhausted. Although water used for this purpose can be thought of as consumed, without it a large amount of needed crude oil would be lost. Nationwide, 1 out of every 4 barrels of oil produced is due to waterflooding. It is expected that this ratio will increase to 1 out of every 3 by the year 1980. In Montana about 1 out of every 3 is the present ratio. Some of the oil being produced be secondary recovery could still be produced by primary means, but this would take more time and expense and therefore might be uneconomical. In the United States about three-fourths of all the water used for flooding is salt water, and an average of 8 barrels of water are injected for each barrel of oil recovered. In Montana the amount of "fresh" water (water used as domestic supplies) used for secondary recovery, amounts to approximately 28% of the total, very close to the national average; 3-4 barrels of water are injected for each barrel of oil recovered (based on 1965 figures).

The amount of water used for the secondary recovery of oil is extremely small compared to that used by agriculture in Montana, and only "a drop in the bucket" compared to the amount leaving the State by natural flow. Agriculture uses a minimum of 10,000,000 acre-feet of water annually. It takes 7,758 barrels of water, each equivalent to 42 gallons, to cover an acre of level ground to a depth of 1 foot (1 acre-foot of water). Secondary recovery of oil uses about 4,500,000 gallons of water daily, or about 5,000 acre-feet of water annually. This is about 0.05 of 1% of the minimum amount used by agriculture. Compared to the 42,000,000 acre-feet of water flowing out of Montana annually, this is less than 0.015 of 1%, which is a very insignificant amount. It is apparent that the total amount of water used for the secondary recovery of oil does not create a statewide problem. However, it should be noted that the water being used for secondary recovery is groundwater, while most of the agriculture-water and all the outflow is surface water. Problems arise when a conflict develops over the use of water—the amount may be relatively small but it may be the only water available or economically obtainable. The use of water for the secondary recovery of oil or any other industrial purpose should be managed so that it is in harmony with the overall water-use pattern for the particular area.

WATER POLLUTION CONTROL MEETING ON AGRICULTURAL WASTEWATERS

By Don G. Willems, Public Health Engineer

State Board of Health

Department of Environmental Sanitation

On October 7, 1968, the Montana Water Pollution Control Council met with representatives of several agricultural organizations to discuss water pollution and methods of control as it relates to agriculture. In his opening remarks, Mr. Winton Wedemeyer, Chairman of the Council, brought out the need to enlist those involved in agriculture to help solve the problems involving sediment, pesticides, fertilizers and other chemicals contained in agricultural wastewaters.

Montana's Water Quality Standards permit very little turbidity, sediment and other pollution. However, at the time the "Standards" were adopted by the Council, it was recognized that all turbidity and sediment caused by man-

(Continued On Page 7)

made activities cannot be eliminated. The "Standards" state that if good conservation practices are used, the sediment and turbidity entering a stream from land use will not be considered pollution. In other words, soil and water conservation is water pollution control.

In addition to sediment, other agricultural pollutants were discussed. Pesticides can be particularly damaging to the receiving stream if not used and applied properly. Nutrients from fertilizers which cause nuisance aquatic growths are carried to our streams by poor irrigational practices. Drainage from feed lots also contributes nutrients and in addition, removes oxygen from the streams. The damage by drainage from a single farm may be small, but the cumulative effect from several farms may in turn cause severe damage.

The consensus of those participating in the meeting was that a need existed for disseminating information among farmers and ranchers about the potential detrimental long range effects of agricultural waste waters and pollution, and means of alleviating problems through cooperative efforts of water users and government agencies.

Following the meeting, an advisory committee was appointed by Mr. Wedemeyer to work with the Council on agricultural water pollution problems. The committee is composed of Mr. William D'Ewart, Chairman, State Soil Conservation Committee; Mr. Don Jones, rancher and board member, Montana Farm Bureau; Mr. Robert Madsen, Hydrologist, U. S. Bureau of Reclamation, Region 7; Mr. Ralph Miracle Secretary, Montana Stockgrowers Association; Mr. A. B. Linford, State Conservationist, U. S. Soil Conservation Service; Mr. H. R. Miller, rancher and President of the State Wildlife Federation; and Dr. Hayden Ferguson, Professor of Soils, Montana State University, College of Agriculture.

THE MONTANA GROUNDWATER CODE

Anthony J. Mancini, CPG

The Montana Water Resources Board is the Administrator of Montana's Groundwater Code. The Groundwater Code is the legislative act relating to and providing for the appropriation and regulation of groundwater. The act defines groundwater as "any fresh water under the surface of the land including the water under the bed of any stream, lake, reservoir or other body of surface water. Fresh water shall be deemed to be water fit for domestic, livestock or agricultural use."

Groundwater can be appropriated only for a beneficial use. Inasmuch as the right to use water in Montana is determined by the doctrine of appropriation, no individual owns groundwater simply because it is under the surface of the land on his property. However, once an appropriation and beneficial use have been made, the right can be transferred like any other property right.

In Montana a right to use groundwater can be obtained by the appropriator's filing certain Notices as described in the Code, or by establishing a right in court. In the latter case, the burden of proving unrecorded rights rests with the appropriator. Forms for filing the notice of appropriation and/or the notice of completion are obtained free of charge from the local office of the County Clerk and Recorder, who, in turn, obtains them from the office of the Montana Water Resources Board in Helena. A right can also be obtained, as are many, by the process of filing well logs and other information in compliance with the laws governing the conservation of oil and gas. Similarly, persons who have filed Log Forms as provided for by the law of 1957 are considered to have complied with the requirements of the Groundwater Code.

One of the most important statements in the Code is: "Appropriative rights shall relate only to quantities of water for beneficial uses and not to water levels, means of use, or ease of withdrawal; and appropriative rights shall not apply to minimal household use as provided . . . hereof." An appropriator should note that the well driller is required to fill out the notice of completion, but the appropriator is responsible for filing the notice.

When a well is constructed and water is withdrawn for a beneficial use, the well becomes the point of diversion and should be accurately located on the notice(s). The driller will not know the location, and the appropriator should provide this information. If the point of diversion is moved, the right is maintained (assuming other people are not injured by the change). A well is any artificial opening or excavation in the ground, however made.

The Groundwater Code also relates to obtaining groundwater without a well, as by subirrigation. Thousands of developed springs have been filed upon as groundwater appropriations. Similarly, surface-water filings have been made on many springs in Montana. A rule of thumb used to determine if a spring should be filed as groundwater or surface water is: if the beneficial use is made at the source of the water coming from beneath the surface of the ground and does not injure others, a groundwater filing is the means; however, spring water flowing in a recognized or established water course is surface water and is appropriated accordingly.

The act provides for the designation or modification of controlled groundwater areas. In the event of a controversy concerning the use of groundwater, an area of controlled groundwater use may be proposed by the Administrator, or by petition of at least 20 or ¼ of the water **users** (not 20 or ¼ of the water **rights**).

Priorities of water rights are based on the premise that "first in time is first in right." Rights to surface water when the appropriation was made before January 1, 1962, take priority over all groundwater rights. On or after January 1, 1962, priorities of both groundwater and surface water appropriations are based upon "first in time is first in right."

Groundwater is found under water table and artesian conditions. Under water table conditions the water is at atmospheric pressure; under artesian conditions, the water has greater than atmospheric pressure and will rise in the well above the top of the aquifer and may even flow to the surface. The Groundwater Code relates to both kinds of aquifers.

In order for the Administrator of the Groundwater Code to be able to perform his function, the Administrator must collect and interpret groundwater information. To this end the Administrator makes use of all available pertinent reports, published and unpublished, and uses the information gathered by the Montana Bureau of Mines, and the U. S. Geological Survey and other Federal agencies. The Administrator also gathers, or causes to be gathered, data in specific instances where time and funds permit. Quantitative data is very sparse for many areas in Montana, and the complete resolution of serious controversies can require several years of collecting adequate and reliable data. It is very important that people who appropriate groundwater for a beneficial purpose submit all information as accurately as possible, so that if a problem does arise the information on the appropriation form can be interpreted with a high degree of confidence.

Groundwater appropriations are filed with the Clerk and Recorder of the County in which the appropriations are made. The County Clerk and Recorder marks the form with an identification number, and the day, month, year, and time of filing. If only a Notice of Completion is filed, the appropriation will be "dated" as of when the notice is filed. However, if a prior Notice of Appropriation has been filed and a person does "within ninety (90) days, commence actual excavation and diligently prosecute construction of a well and, upon its completion, file a notice of completion . . ., " the date of appropriation will relate back as specified by the Groundwater Code.

The use of the Declaration of Vested Groundwater Rights form, which allowed a right to be dated back to the time of first beneficial use (in some cases prior to the Spanish-American War of 1898), was limited by the Code to "four years after January 1, 1962." With respect to Vested Rights, rights to surface water, where the date of appropriation precedes January 1, 1962, shall take priority over all prior or subsequent groundwater rights. Clerks and Recorders of all counties are required to transmit copies of every groundwater appropriation filing to the Administrator in Helena.

Certain regulations for the drilling of water wells have been put forth by the Montana Water Well Contractors Examining Board. Anyone who constructs a water well more than 25 feet deep upon land other than his own (owned or leased) for compensation, must be licensed by the State of Montana to do so. The GW appropriation form has a place to record the number of the contractor's valid license.

The Montana Board of Health has criteria and guidelines for the construction of wells and the protection of public water supplies. This information is available to the public, as is information secured under provisions of the Groundwater Code. Presently, information collected by the Administrator is being compiled into Groundwater Inventory reports and maps, on a county-by-county basis. These reports, published several times each year, attempt to bring together all available information pertaining to groundwater for a specific portion of Montana; and they include discussions of such topics as general geology, the groundwater potential of every formation, the availability of water as to depth and quality, the use of groundwater and other information pertaining to the resource. Copies of these reports are available to the public.

New Publication Available. The Montana Agricultural Experiment Station of MSU at Bozeman has published Bulletin 620, dated April 1968, and titled "Montana Surface Water Law, Measurement and Structure," written by C. C. Bowman and W. W. Lessley. The free booklet is in 4 parts: Montana Water Law, water measurement, irrigation structures, and grade and capacities of farm ditches. Mr. Bowman is Head of the Agricultural Engineering Dept. (MSU), and Mr. Lessley is District Judge of the 18th Judicial District of Montana.

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MONTANA WATER RESOURCES BOARD

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PUBLIC HEARING ON MONTANA'S COMPREHENSIVE WATER PLAN

By George B. Maxey
Planning Consultant

On October 14 the Montana Water Resources Board will hold a public hearing in Helena on certain aspects of the State Comprehensive Water and Related Land Resources Plan. This Plan is being formulated to determine Montana water needs and methods of satisfying them in the next fifty years. Recommended developments and implementation of them with target dates of the years 1980, 2000, and 2020 are the chief objectives of the plan.

Progress on the plan, to be reported at the hearing, includes the formulation of a framework consisting of four phases:

1) An inventory phase, during which detailed knowledge of the State's water resources will be compiled, and computerized in a storage and retrieval system for easy accessibility.

2) A water needs and projections phase, during which recommendations for future developments based upon the availability of water will be made. Maximum emphasis will be placed on the time period from now to 1980, for which relatively accurate projections can be made. However, projections will also be made for the years 2000 and 2020 which will keep us in line with other planning now taking place in the West.

3) The third phase will involve recommended developments to be accomplished by the target years 1980, 2000, and 2020.

4) The fourth phase is an implementation phase. This is actual use of the water resources and will depend upon the needs of Montana as interpreted by the Governor and Legislature. Plans can be no more than guides for them to follow. The plan will have to be continually updated and implemented as developments occur.

The time schedule for accomplishment of the first three phases of the plan involves about four years; the inventory to be essentially completed by 1969, the water needs to be determined within three years and recommended developments to be formulated by 1972. Since some water resource projects are already in progress, recommendations for their completion or modification will be made a part of the Board's overall planning efforts. Thus, some action on recommended developments and implementation will be taken at an early stage.

In addition to developing a framework for the State Water Plan, the Water Resources Board has tentatively adopted some basic assumptions for planning, which will be reviewed at the public hearing. These assumptions primarily relate to national conditions, technological developments and trends over which Montana has little control, and which must be more or less accepted as constraints on planning and development.

The adoption of a State Water Plan is of great significance to Montana since it will result in a far more comprehensive knowledge of water resources and their importance to the State. It will allow Montana to place a legitimate and well-documented claim upon the water that is, or will be, needed in the State for a long time to come. It will also allow evaluation of the amount of water that may be needed from importation, if any. Certainly it will serve as the best weapon to combat the claims of other states upon Montana's water. Further, it will lay the groundwork for equitable and efficient use of water resources for the good of all Montanans.

The Montana Water Resources Board hopes that the statewide public hearing will be well attended by members of the Legislature, interested State and Federal agencies, and private individuals concerned with our State's water resources development.

WATER RESOURCES SURVEY EXPANDED

By Hans L. Bille
Water Resources Survey Supervisor

The Water Board's Water Resources Survey has now been completed in 40 of Montana's 56 counties, the last two of these being Phillips and Valley Counties. A published report on Phillips County will be available this month, and it is expected that the Valley County report will be available by the end of October. This survey includes an inventory of water rights, water use and the mapping of irrigated lands.

When all 56 counties have been completed the survey will need to be continually updated by a re-survey since developments during the many years following the original survey will add much to the data compiled.

This summer, field work was completed in Liberty and Toole Counties and the published reports on these are scheduled for printing by December 31, 1968. Field surveys are presently being conducted in the Counties of Glacier, Sanders, and Mineral, and will continue until completion in late October of this year. Publications on these counties will be available by June 30, 1969.

Surveys are scheduled to start early next spring—April or May, 1969—in counties not yet surveyed in the

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Edited by Norman J. Brown

(Continued From Page 1)

northern and eastern portions of Montana. Some of the counties being considered for survey during the next biennium (1969-1970 1970-1971) are: Beaverhead, Daniels, Sheridan, Roosevelt, Richland, McCone, Dawson, Prairie, Garfield, Petroleum, and Fergus. This work is necessary to meet the Water Board's target date of 1972 for completion of the Water Resources Survey in all of Montana's 56 counties. When this survey is completed Montana will have the most complete inventory of water rights, water uses, and irrigated lands of any of the 17 Western Reclamation States.

The acceleration of the Water Resources Survey program made it necessary to increase the number of personnel performing this work and, consequently, present allotted office space has proved inadequate. Therefore, the Water Resources Survey Division will move from the Water Resources Board's office quarters in the Sam W. Mitchell Building, Helena, to new quarters in an office building now under construction at the corner of Roberts and Helena Avenue. The new quarters are scheduled to be ready for occupancy by the middle of October of this year.

STREAM MEASUREMENTS

By Melvin F. McBeath
Assistant Project Supervisor
Operation and Maintenance Division
Montana Water Resources Board

The Water Resources Board is charged by law with investigating or causing to be investigated streamflows and water measurements within the State and primarily discharges this responsibility through a co-operative stream-gaging program with the Water Resources Division of the U.S. Geological Survey.

In addition to this phase of hydrological work, the Board's Hydrographic Section installs, operates and maintains many other stream-gaging and seepage stations in areas of the State where State-owned reservoirs and canals are located.

The Board's Hydrographic Section was established in August, 1959. Prior to that time the Water Board conducted only limited stream flow measurements and had no definite program in this area, but since then the Water Board has carried on a program of establishing an average of five recording stations each year. These stations are placed at key locations on the streams and canals of Water Board projects. A number of seepage stations also have been installed to check on water deliveries and losses. The Board provides financial support to more than 100 hydrological stations in its cooperative program with the U.S. Geological Survey, and also contributes nominal support to another 11 stations which are maintained by the U. S. Army Corps of Engineers.

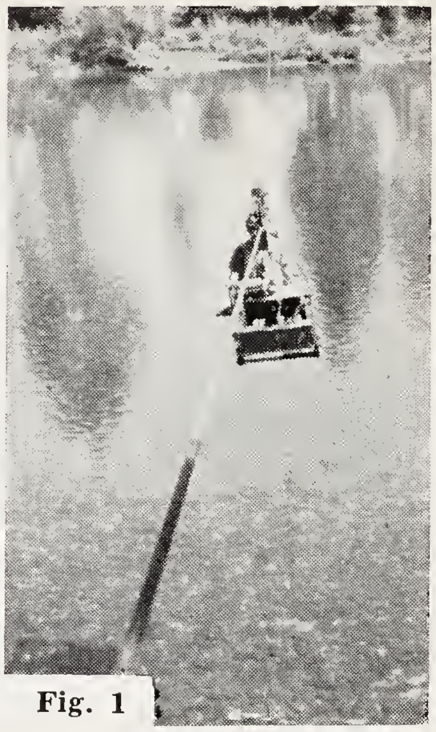

Fig. 1

During the 1966-1968 biennium the Board's Hydrographic Section made more than 800 streamflow measurements at 50 recording stations and 20 seepage stations. Measurements and water temperature readings are taken at least bi-weekly during the irrigation season.

Cables and cable cars have been installed (Fig. 1) by the Hydrographic Section across rivers and large streams to facilitate streamflow measurements where no bridges exist. A reel or winch is used to lower the meter into the water. Where bridges are located, the reel or winch is used on a special crane to lower the meter over the edge of the bridge. (Fig. 2).

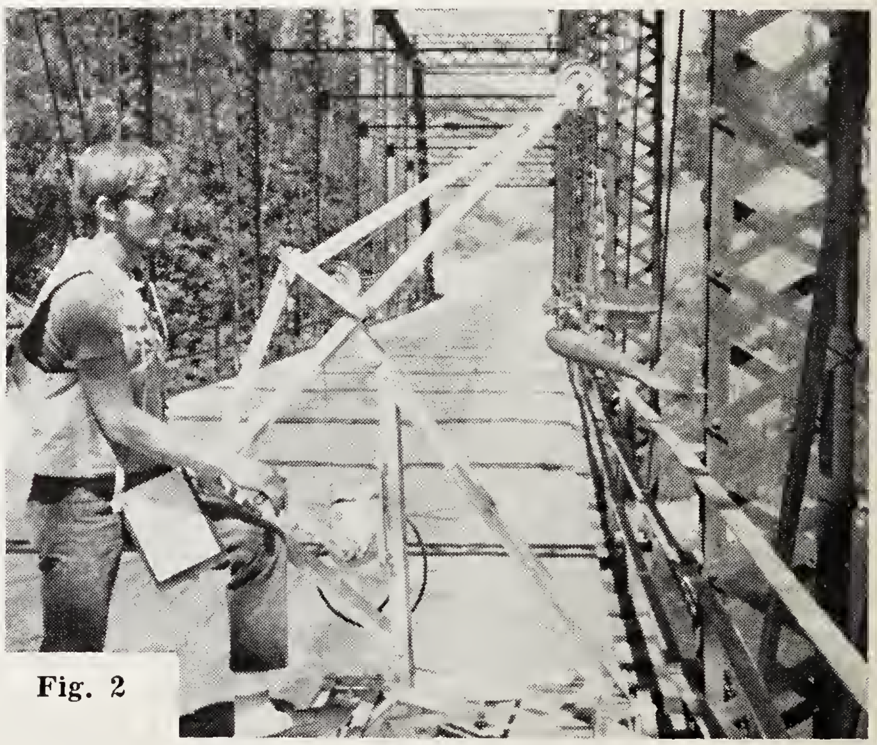

Fig. 2

At the end of each water year (September 30) or irrigation season, the records from the recording stations and the data that have been collected from the

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water measurements is compiled into book form and the information is made available to all who are interested. The Water Board uses the information to study the operating efficiency of State-owned projects.

The Hydrographic Section also compiles monthly records of the quantity of water stored in State-owned reservoirs; this data is generally provided by the various Water Users' Associations and local dam tenders, and provides a monthly record of the capture or release of water in the reservoirs. This information is also compiled at the end of each calendar year in a complete volume together with the stream-gaging measurements for ready reference in managing water distribution and is available to the public.

This section also conducts an aquatic weed control operation, treating approximately 25 to 50 miles of canals each year; in addition, about 25 miles of canals are sprayed for ditch bank weed control.

PACIFIC NORTHWEST RIVER BASINS COMMISSION

By Alex D. McDermott

Montana Alternate Commission Representative

The Pacific Northwest River Basins Commission was established by a Presidential Executive Order on March 6, 1967. It was the first river basin commission created under the provisions of the Water Resources Planning Act, P.L. 89-80. The governors of the states of Washington, Oregon, Idaho, Montana, and Wyoming had requested that the PNWRBC be established. In addition to those five states who are members of the commission, proceedings of the commission's activities are sent to the adjoining states of Utah, Nevada, and California who have small portions of their states within the drainage area under the auspices of the PNWRBC.

The federal agencies named are the Departments of Agriculture, Army, Commerce, Health, Education and Welfare, Housing and Urban Development, Interior, Transportation, and the Federal Power Commission. Represented on the commission also is the chairman of the U.S. Entity for the Columbia River Treaty. Eligible for participation is one member from each interstate agency created by an interstate compact to which the consent of Congress has been given and whose jurisdiction extends to the waters of the area.

Undoubtedly, one of the factors motivating the governors to establish the Pacific Northwest River Basins Commission was contained in Section 3-d, which stated, (d) "Nothing in this act shall be construed as authorizing an entity established or acting under the provisions hereof to study, plan, or recommend the transfer of waters between areas under the jurisdiction of more than one river basin commission or entity performing the function of a river basin commission."

The commission is jointly financed by the states and the federal agencies with each group participating to the extent of 50 per cent. The chairman is an exception. He is appointed by the President and paid entirely with federal funds. He acts as the principal executive officer of the commission and also serves as the coordinator for the federal members. The vice-chairman is selected from among the state members. He also has executive duties related to concurrence in selecting personnel and consulting with the chairman in regard to other operational decisions pertaining to staff and other commission activities.

The commission is charged with preparing and keeping up to date, to the extent practical, a comprehensive coordinated joint plan for federal, state, interstate, local and non-governmental development of water and related land resources provided, however, that the plan shall include an evaluation of all reasonable alternate means of achieving optimum development of water and related land resources of the Columbia River Basin. The plan may be prepared in steps including recommendations with respect to individual projects. The area includes all of Washington, all of Oregon except that area draining into southern California along the southern boundary, all of Idaho except that drained by the Bear River, and those parts of Wyoming and Montana that drain into the Columbia River system.

The commission utilizes a number of committees composed of state and federal agency members and is taking advantage of the committee system developed during the past twenty years under the sponsorship of the Columbia Basin Interagency Committee. The committees now authorized are as follows: 1. Planning and Program, 2. Economic Studies, 3. Fisheries, 4. Hydrology and Hydraulics, 5. Meterology, 6. Power Planning, 7. Water Supply and Water Pollution Control, 8. Aquatic Plant and Insect Control. It is hoped that through these committees the commission will accomplish many of its objectives and from time to time may add special committees when deemed advisable.

The commission has accepted responsibility for the coordination and guidance of three major water planning studies now under way in the region. 1. Columbia-North Pacific Framework Study, 2. Willamette Basin Study to be completed in 1969, 3. Puget Sound and Adjacent Water Study also scheduled to be completed in 1969.

The commission shall submit to the council and the governor of each participating state a report on its work at least once each year. Plans for development when approved by the commission must be sent to each state and federal participating agency for their study and analysis. They have 90 days to submit their views. At the end of this period, the plan will then be submitted to the Water Resources Council. Such report shall be transmitted through the president to the Congress. After such transmission, copies of any such reports shall be sent to the heads of such federal, state, interstate, and international agencies as the president or the governors of the participating states may direct.

Water and related resources development is one of the most vital issues facing the nation today. It is, therefore, appropriate that we plan ahead for full development and identify the ultimate requirements in this area. In the Northwest we are deeply concerned and involved with the entire water program of the western states, both east and west of the Rockies. We need time to establish our ultimate needs with projections to 50 or 100 years hence. The efforts of the Pacific Northwest River Basins Commission, at this time, will be extremely beneficial to the future generations that will reside in our great Pacific Northwest.

MONTANA'S STATE LAND DEPARTMENT

By Mons L. Teigen

Commissioner of State Lands

The operation of Montana's State Land Department should be of considerable interest to the general public. If not for the 5,000,000 acres of land currently under the department's jurisdiction and the various uses it can be put to, then it should be of interest to the general taxpayer from the standpoint of the substantial financial contribution being made to the local government from the distribution of interest and income received from the use of these lands and the funds directly attribut-

(Continued On Page 4)

able thereto. For example, it may come with some surprise to many to learn that the distribution per school age child in the State of Montana amounted to $34.67 per child from the income received during calendar year 1967. The total allocation for that year amounted to better than $8,000,000. This was an increase of over $2,000,000 from the previous year.

It is interesting to note how the State of Montana acquired the lands which it presently owns. These land acquisitions came about as a result of the terms of the Enabling Act which granted sections 16 and 36 in each township to the State of Montana for the establishment of the common schools. In addition to that there were block grants made for various institutions and segments of the university system. This grant, in itself, created some serious problems in that the scattered pattern created management problems which are still of major concern to the Department. The scattering, however, did make possible an excellent cross section of the lands in the state, both highly productive and low. In reflecting upon this, one can only assume that the founding fathers must have contemplated the State of Montana disposing of most of this land, hence the scattered pattern. Montana's State Land Board, down through the years, has been rather conservative in their disposal program; as a result, of the nearly 6,000,000 acres originally granted to the state there are 5,302,589 acres still under control of the State.

Another requirement under the Enabling Act was that the income from the sale of lands was to be placed in a permanent fund and only the interest earned by the fund be made available for distribution to the schools. There is presently in the Montana Trust and Legacy Fund $54,400,328 as of June 30, 1968. This fund has been augmented by oil royalties, timber sales, other royalty payments, right-of-way payments and other permanent dispositions from the land. However, due to the restrictions that have been placed upon the type of investments that may be held in the portfolio by the Constitution, the fund has actually failed to grow in purchasing power as it should. Under the terms of the Constitution, the fund may be invested in government securities which are fully guaranteed by the Federal Government, Federal Land Bank bonds and municipal bonds issued by any school district or municipality of the State which are a general obligation of the political sub-division. No doubt, at the time the Constitution was written, investments in the business community were viewed with some misgiving by the general public and government securities were looked upon as the one properly safe investment for these sacred trust funds. Our experience over the past few years has demonstrated the fallacy of this assumption when we find the fund growing but the beneficiaries receiving less than they might in constant dollars of purchasing power. Repeated proposals have been made before the legislature to submit to the electors of the state an amendment to the Constitution which would allow the legislature to establish broadened investment authority and remove the restrictions placed upon the fund by the Constitution itself. It is hoped that another attempt will be made to obtain favorable consideration on this proposal by the 1969 Legislature.

Montana being a range state, has the bulk of its land classified as grazing, over 4,000,000 acres in fact. This land is leased on a ten year basis with a minimum grazing rental established by a formula which fluctuates with the price of beef cattle. In addition, these lands are subject to competitive bidding which bids bring in revenue over the minimums set by law. The income from grazing during fiscal year ending June 30, 1968, amounted to slightly more than $1,000,000. The state also owns 490,000 acres which are presently under cultivation and being farmed on a crop share basis. The income from agricultural land during fiscal year ending June 30, 1968 was $2,345,850.

Mineral leasing activities have been particularly intense during the past two years. As a result of the discovery of Bell Creek oil field in southeastern Montana, as well as other areas of more limited interest, over 2,000 oil and gas leases have been issued for a gross return of $5,721,000 in the first year rentals and bonuses. In addition to oil and gas, there is continuing interest in developing the substantial sub-bituminous and lignite coal deposits located in the state and a cooperative core-drilling program conducted by the Montana Bureau of Mines and Geology has been conducted on state lands in an attempt to determine potential coal deposits underlying the surface. Interest in uranium has grown in the last biennium to the extent that we have leased over 154,000 acres since May of 1957. It should be pointed out that both the coal mining lease and the uranium lease contain a clause requiring that a plan for mining and reclaiming the mined area be prepared prior to engaging in the mining operation.

The 1967 Legislature enacted the Resource Development law which permits the Land Board to set aside up to 2½ percent of rental income to use for development of land with a view towards increasing productivity and thereby the income to the State. This law was implemented by the Land Board in August, 1967 and as of June 30, 1968, over $222,000 has been set aside in this fund. Some of the projects contemplated or under way by the department under this program at the present time are land leveling and irrigation developments along some of the major rivers of the state, sagebrush spraying projects, reseeding projects, drainage programs as well as several quiet title actions including islands in navigable streams. Due to the requirement that these monies be expended for development designed toward increasing income from the land, the Department has concerned itself initially with those projects which involve water development. This is the one area where the expenditure of these funds can result in substantial increases in income. For example, it is not unusual to find a tract of unimproved grazing land which will be leasing for an average of 25c to 50c per acre which when leveled, border diked and provided with an adequate water supply can return in excess of $12 to $15 per acre.

In conducting this program considerable reliance is being made upon other agencies of the State and Federal Government to provide technical assistance in those areas in which they are particularly well qualified. For example, the Soil Conservation Service and the Soil Conservation Districts have been exceptionally helpful in making the preliminary surveys on many of the projects we are presently engaged in. The Fish and Game Department will be called upon to advise as to the effects of our program on wildlife resources in the project areas. It is anticipated that in time the State Land Department may be contracting for water from various state and federal water projects to irrigate former arid lands which have been unable to receive water in the past due to the fact that no money had been appropriated for this use heretofore. Although the program is in its infancy, this particular legislation will have far reaching consequences on the future of state lands and their development.

INCREASED WATER RESEARCH UNDER FEDERAL-STATE COOPERATIVE PROGAMS

**Roland R. Renne, Director, Office of
Water Resources Research
U.S. Department of the Interior,
Washington, D.C.**

Cooperative Federal-State water resources programs initiated by Congressional action since mid-1964 are launching a concerted three-way attack of research, planning and development, and quality control to solve the Nation's serious water problems. The new legislation includes the Water Resources Research Act of 1964, with 1966 amendments, the Water Resources Planning Act of 1965, and the Water Quality Act of 1965, supplemented by the Clean Water Restoration Act of 1966.

Water research in general and in the three major water areas covered by recent legislation in particular, has experienced a sharp rise in the last three years. Expenditures of the Federal Government for water research doubled from $70 million in Fiscal Year 1965 to $136 million in 1968. Currently expenditures have leveled off because of budget stringencies, but funds for water research in the next few years are expected to rise.

The Federal Council for Science and Technology's Committee on Water Resources Research, in its report dated February 1966, proposed a ten-year program of water resources research with a suggested goal of approximately $200 million of Federal funds for Fiscal Year 1971. No dollar amounts were suggested beyond 1971 for the second five-year period of the decade, but recommendations made by the Committee regarding research categories in greatest need of further research imply increased total expenditures beyond the $200 million after 1971.

Montana is currently participating in research, planning, and pollution control programs financed by the Federal Government. Under the Water Resources Research Act of 1964, with 1966 amendments, Montana receives an allotment of $100,000 annually for water research projects of particular concern to the State and administered through the Montana University Joint Water Resources Research Center, directed by Dr. Roy E. Huffman at Montana State University in Bozeman, with the University of Montana at Missoula and Montana Tech in Butte participating. In addition, Montana has shared each year in the matching funds available through the Water Resources Research Act which currently totals $3 million for the Nation.

Montana also is participating in research supported under the third part of the Act, known as Title II, authorizing a broad area of research dealing with significant national water problems. Some 700 research projects are now in operation under the Water Resources Act funds with 115 universities and 40 other private and public research organizations involved. In addition to more than 1,000 principal research investigators, over 1,500 advanced undergraduate and graduate students are employed on research projects financed in part or entirely under the provisions of the Water Resources Research Act.

The extent of increased research resulting from recent legislation dealing with water resources, planning and development, pollution control, and related aspects is reflected in the number of water resources research projects currently underway in the United States compared with three years earlier. Although all research projects are not recorded in the Science Information Exchange Office of the Smithsonian Institution in Washington, the most complete data available are secured from this source. There are now 4,201 water research projects currently underway in the United States. These are recorded in the Water Resources Research Catalog, Volume 3, published in 1968, and prepared for our Office of Water Resources Research by the Science Information Exchange. This is more than twice the number of projects recorded three years earlier.

Of the 4,201 projects, nearly three-fourths (3,016) are Federally supported and the remainder (1,185) are non-Federally supported. These projects are being undertaken by 606 performing organizations, of which 135 are Federal agencies and the remainder, or 471, are non-Federal, including State and local government agencies.

The heavy emphasis on water quality management and protection, focused through the Federal Pollution Control Administration, is shown by a large increase since 1965. Approximately one-third (1,370) of all current water resources research projects recorded deal with some aspect of water quality management and protection. These include identification, fate, and effects of pollutants; waste treatment processes; water treatment; and water quality control. Three years ago there were only 298 projects recorded dealing with water quality management and protection. In other words, there has been an increase of nearly fivefold in this type of water research in three years.

The second largest type of water research currently being undertaken throughout the Nation deals with aspects of the water cycle. These include precipitation; snow, ice, and frost; evaporation and transpiration; streamflow; groundwater; lakes; erosion and sedimentation; chemical process; and estuarine problems. More than one-fourth of the total recorded water research projects (1,128) deal with water cycle aspects. This is an increase of nearly threefold over the 448 projects in operation three years ago.

The third largest type of water research in the Nation deals with water resources planning problems. These include techniques of planning; the evaluation process; cost allocation, cost sharing, pricing and repayment; water demand; water law and institutions; nonstructural alternatives; and ecologic impact of water development. Currently more than one-eighth (528) of total water research projects recorded deal with water resources planning problems. This is an increase of 312 projects over the 216 projects recorded three years ago.

All major water research categories show increases in the number of projects in operation now compared with three years ago except one. This exception is the category covering "Water Supply Augmentation and Conservation," which includes saline water conversion, water yield improvement, use of water of impaired quality, and conservation in domestic use, industry, and agriculture. There are exactly 100 fewer projects dealing with these types of water problems currently recorded (388) than there were three years ago (488).

Relatively small increases in research effort are shown in all other types of major water research categories. These include:

(1) Research in water engineering works covering design; materials; construction and operation;

(2) Research in water quantity management and control covering control of water on the land; groundwater management; watershed protection; and effects of man's activities on water;

(3) The nature of water covering water properties; and aqueous solutions and suspensions;

(4) Research in water resources data covering network design; data acquisition; and evaluation, processing, and publication;

(Continued On Page 6)

(5) Research grants and contracts for manpower and facilities.

This survey indicates the heavy emphasis currently placed upon research in water pollution problems, in problems dealing with the hydrologic cycle, and in research essential for effective planning and development of water resources programs and projects. The impact of this stepped-up research effort will become increasingly apparent as we continue to deal with our serious water problems in Montana and the Nation as a whole.

THE CONJUNCTIVE USE OF GROUND AND SURFACE WATER—A POTENTIAL FOR EXPANDING MONTANA'S ECONOMIC BASE

By R. J. McConnen* and D. W. Boyd**

Montana has one set of regulations which governs the use of surface water and another which governs the use of ground water. In most cases, Mother Nature ignores this legal separation and water continues to move from ground water to surface water and from surface water into ground water. Except where ground water is a stock resource, the ground and surface water of an area belong to a single water system. The way in which surface water is used will influence the associated ground water, and vice versa. When we study the conjunctive use of ground and surface water, we explicitly recognize what we all generally accept; ground and surface water belong to a single water system.

The conjunctive nature of ground and surface water has been recognized in planning the use of water in many parts of the world. For example, in the Santa Clara Valley of California, surface flow which occurs after the irrigation season is diverted into percolation basins and the ground water aquifers are artifically recharged. This raises the ground water level and means both cheaper pumping cost the next season and less salt water instrusion into that part of the aquifer near the sea.

Very little ground water is pumped for irrigation in Montana at present, but it would be wrong to assume that there is no conjunctive use of ground and surface water. For example, available evidence indicates that in the Gallatin Valley, the long time use of surface water for irrigation has increased the general level of the ground water table and significantly increased the drainage problems in parts of the valley. Almost every irrigated farm in the state has at least one area where irrigation raises the local ground water table enough to make commercial use of that area either difficult or impossible.

But it is not these negative aspects that make the conjunctive use of ground and surface water such an important topic for Montanans. Where significant ground water exists, good conjunctive use of water can be the means of both expanding a community's economic base and increasing the individual farmer's ability to earn income.

Most ground-water aquifers have two characteristics that recommend them as a possible source of irrigation water. First, they provide a primary means of distributing water. Instead of building a ditch to transfer water from a stream to an area, the water can be pumped in that area where it will be used. Second, most aquifers have some inter and intra seasonal storage capacity. Therefore, many aquifers can be used at least in part as substitutes for surface storage.

While the U.S. Geological Survey and the Montana Bureau of Mines have been gathering ground water information in Montana, not enough information is available to make a reasonable estimate of the statewide economic impact of good conjunctive use of ground and surface water. Ground water surveys are both expensive and time consuming. An excellent ground-water report has been released on the Gallatin Valley and another will soon be released on the Flathead Valley.

In the remainder of this article we'll give a very brief review of two studies that have been made using the Gallatin Valley report. Finally, we'll make a plea for both expanded support for ground water surveys, and for economic studies of the conjunctive use of ground and surface water.

The first economic study using the Gallatin Valley ground water report recognized, but did not include provisions for true conjunctive use in the analytical model. (1) On the basis of this very preliminary study, it was estimated that the optimum integrated use of ground and surface water in only part of the valley could increase net farm income by over $200,000. Gross farm income would be increased by about $600,000 and the total income generated in the valley (because of multiplier effect) would increase by at least $1,000,000. A net value per acre foot of water of about $2.50 was used as a basis for these estimates. More recent empirical estimates have placed the net value per acre foot of water when used for small grains and forage in Montana at over $8.00. While the study was preliminary, and the analytical model used was far too simple, the study does indicate the possible potential of the better joint use of ground and surface water in Montana.

The second study was based on a much more sophisticated analytical model. (2) The model explicitly recognized the true conjunctive nature of ground and surface water in the Gallatin Valley. Since this was the purpose of the study, less emphasis was placed on empirical estimates of the economic consequences of conjunctive use. The study demonstrates the importance and usefulness of modern computers in planning the development of complex water systems. The inter and intra seasonal storage characteristics of the ground water aquifer can be used to lessen (but not eliminate) month to month and year to year variations in the amount of irrigation water available. If the ground water table is low, fall runoff and flood waters can be used to recharge the aquifer and make more water available in late summer. Irrigation itself is one of the principal means of recharging ground water aquifers and induced precipitation (i.e. "rain-making") was recognized as a possible part of the planning problem for the total water system. The model provided a means for a very good reproduction of a thirty year hydrologic history of the Gallatin Valley and provides a basis for estimating the impact on the total water system if part of that system is changed by man.

Both of the studies mentioned above are preliminary inasmuch as they are not detailed enough to serve as the final basis for operational development. They do, however, suggest both that adequate models for operational planning of the conjunctive use of ground and surface water can be developed and that the possible economic impact is too great for Montana to ignore.

Because of our institutions (laws, organizations, habits, etc.) and because of the complex nature of the total water system, the market place **alone** cannot provide a process which will guarantee full realization of the economic potential of Montana's water resource Development planning is also required by Federal an State Agencies and especially by local groups. Planning is nothing more than a previously agreed upon coordination that will permit the outcome to be predicted.

(Continued On Page 7)

Prediction requires knowledge. If we are to combine market forces and planning action in order to realize the economic potential of our water resource, we need to expand our knowledge of the economic and hydrologic factors involved. Not only does planning require knowledge, but knowledge can spur us on to action.

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**Dr. D. W. Boyd, Assistant Professor, Department of Industrial and Management Engineering, Montana State University, Bozeman, Montana.

STATE COUNCIL OF NATURAL RESOURCES AND DEVELOPMENT

The State Council of Natural Resources and Development was established by legislative enactment in 1953, and the 1967 Legislature enlarged its membership from eight to its present composition of twelve State agencies. The Council membership is made up of the heads of these agencies.

Last July 1 the Council initiated, on a trial basis, an office of coordination, and Mr. Bob Cooney, Assistant Chief of the Recreation and Parks Division of the Fish and Game Department, was named Coordinator. He is on loan to the Council for six months.

The Council Chairmanship is rotated among the members and meetings have been held on a quarterly basis. The primary objectives of the Council during its fifteen years of existence, as outlined by Mr. Cooney, have been:

1. Joint consideration of the administrative problems and related needs that the agencies have in common in such areas as water resources, forestry, land management, outdoor recreation, highway location, water and air pollution, and many others.
2. Achieving effective coordination among the activities of the twelve member agencies. In this way, every effort is made to avoid duplication as well as gaps in resource programs.
3. The Council acts in an advisory capacity to the Governor on matters of natural resource administration and planing.

In the past, coordination efforts of the Council have been largely carried out by periodic meetings in Helena. In addition, several field trips have been held to areas of joint interest.

The coordination of the office, Mr. Cooney explains, is expected to provide continuity of effort as well as a focal point of activity for projects undertaken by the Council.

A carefully drawn land use project being undertaken by the Council is explained by Mr. Cooney:

This project consists of a detailed joint study of the Buffalo Creek Cooperative State Grazing District in Yellowstone County. This region, lying east of Billings and north of the Yellowstone River, consists of somewhat more than one-half million acres. It is composed of approximately 14 per cent Federal land, three per cent State land (15,000 acres), and the remainder privately owned. It presents an interesting and somewhat typical example of range and farm lands of central and eastern Montana. Each of the Council agencies has responsibilities of varying degrees in this region. All are carrying out field studies leading toward recommendations pertaining to future land uses in the area.

In this way, the expertise of each agency will be drawn upon. The individual reports will then be brought together by the Coordinator into a joint report. This document will be made available to the Governor, members of the Legislative Assembly, interested Federal agencies, Montana's Congressional Delegation, and other interested parties.

The project, in addition to its value to the land area studies and to a better understanding of public lands generally, may well set a pattern for future joint programs on a variety of natural resource subjects of interest all across the state.

The present composition of the Council is as follows: Chairman, Lewis M. Chittim, State Highway Engineer; Members: Everett V. Darlinton, Director, Montana Water Resources Board; Mons L. Teigen, Commissioner, Department of State Lands and Investments; Frank H. Dunkle, Director, Montana Fish and Game Department; Gareth C. Moon, State Forester; Dr. John S. Anderson, Executive Secretary, Montana Department of Health; Arthur H. Hartenburger, Chief, Planning Division, Department of Planning and Economic Development; Dr. Edwin G. Koch, Director, Montana Bureau of Mines and Geology; Lowell C. Purdy, Commissioner, State Department of Agriculture, O. M. Ueland, Executive Secretary, State Soil Conservation Committee; David G. Rivenes, Secretary, Montana Grass Conservation Commission; Norman J. Beaudry, Executive Secretary, State Oil and Gas Conservation Commission.

GROUND-WATER LEVELS AND ARTESIAN PRESSURES IN MONTANA

By Charles W. Lane, District Chief, U.S.G.S.

Water Resources Division, Helena, Montana

A continuing program for the systematic collection of records of ground-water levels in selected observation wells has been made a part of a program for the investigation of the ground-water resources of Montana by the U.S. Geological Survey in cooperation with the Montana Bureau of Mines and Geology.

The intent of the water-level measurement program is to provide long-term continuous records of changes of the water level in representative wells in the various aquifers (water-bearing formations) throughout the State. Uses of such records are: (1) to facilitate the prediction of trends in ground-water levels that indicate changes in storage; (2) to serve as a framework to which shorter records from project studies may be related; (3) to aid in prediction of base flow of streams; (4) to appraise the relationship between water-level fluctuations and precipitation, pumping, and other factors; (5) to identify areas of detrimentally low or high ground-water levels; and (6) to provide information for use in basic research. Records for the foregoing and other uses need to be compiled and published in a manner that will assure their current and future availability.

The systematic collection of data on ground-water levels in Montana was begun on a limited scale in 1947 by the U.S. Geological Survey under a federal program to develop a nationwide observation-well network that would reflect the ground-water supply situation in the nation on a current basis. Record collection continued under this program until 1964, when State funds were made available through the State Engineer to expand the network on a cooperative basis. In 1965 the observation-well network was made a part of the cooperative ground-water program of the Montana Bureau of Mines and Geology. Before 1956, the water-level records were published annually by the U.S. Geological Survey as Water-Supply Papers. Since 1956, the records of water levels in the federal network of observation wells have been published in 5-year increments as Water Supply Papers. Starting in 1966, the records from the Statewide network including those from the federal network, are published annually as Bulletins of the

Montana Bureau of Mines and Geology and are available from that agency.

The source of most ground water is precipitation, which varies widely over Montana. The averages for the seven climatological divisions set up by the U.S. Weather Bureau in the State range from 13.07 inches in the north-central division to 19.04 inches in the western division. The lowest long-term average at an individual station is 9.79 inches, and the highest is 34.38 inches; however, seven of nine seasons at a station in Glacier National Park have produced totals of more than 100 inches. Much of the water from precipitation returns to the atmosphere by evaporation or transpiration or flows overland; part seeps into the soil zone and percolates downward to the underground reservoirs. Water in these reservoirs occurs in open spaces known as voids, interstices, pore spaces, joints, fractures, or solution channels in the rocks mantling the State. The size, shape, character and distribution of the open spaces determine, to a great extent, the occurrence of ground water. The open spaces are generally interconnected and act as minute conduits through which the water moves laterally at a slow rate until it is discharged to the earth's surface through springs, wells, and effluent (gaining) streams, or to the atmosphere by evaporation and plant transpiration. Under natural conditions, over a long period of time, the amount of water that is added to ground-water storage is in approximate equilibrium with the amount that is discharged.

Ground water in Montana occurs under a wide range of conditions and in various degrees of usefulness. Throughout most of the State it can be obtained from wells drilled into one or more of the numerous aquifers, but not necessarily at a reasonable cost or in the quantity or of the quality desired. In some areas of the State, ground water is relatively difficult to obtain, and aquifers yielding only a few gallons per minute to wells are of considerable importance. In other areas, where aquifers may yield several hundred gallons per minute to wells, formations yielding only small amounts of water may be classed as nonproductive.

Aquifers may be classed as water-table or artesian and their behavior under development is considerably different. A water table aquifer is exposed at the surface and contains a saturated zone and an unsaturated zone. The surface within the saturated zone at which the pressure is atmospheric is known as the water table. The water level in a well that is hydraulically connected with the aquifer coincides with the water-table. An artesian aquifer is overlain by relatively impermeable material (material through which water does not move readily) and contains water under sufficient pressure to rise above the top of the aquifer if penetrated by a well. If the pressure is sufficient to raise the water above the land surface, the well will flow.

Water levels in wells are also constantly fluctuating, and may decline or rise a fraction of an inch or many feet in a relatively short time. They are influenced by factors such as seasonal changes in rate of recharge to and discharge from the aquifers, local geology, direct recharge from precipitation, local irrigation practices, pumping from nearby wells, evaporation and transpiration of water by vegetation, and changes in water levels in nearby lakes, streams, or drains. In artesian wells, changes in water level may occur quickly over large areas as a result of nearby pumping. Temporary influences on the water levels in artesian wells result from changes in atmospheric pressure, earthquakes, earth tides, changes in surface-water stage, and changes in surface loading.

In Montana, water-level fluctuations generally are cyclical, reflecting seasonal changes in the amount of water in storage, which varies because of differences in rates of recharge and discharge. The water levels generally rise in the spring and summer and decline during the fall and winter. Long-term trends in water-level fluctuations may be impressed locally on the seasonal cycle. These trends reflect deficient or surplus recharge over a period of years, owing to natural climatic variations or to man-induced variations such as a change in irrigation pattern, land drainage, or pumping from wells.

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MONTANA WATER RESOURCES BOARD

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Water Planning Consultant

Dr. George Burke Maxey, a native of Montana and noted Hydrologist-Geologist on leave from the University of Nevada, became Planning Consultant to the Montana Water Resources Board on May first.

Dr. Maxey will assist the Water Board in preparing and coordinating a comprehensive state water plan and ultimate needs study. He will also continue as a consultant to the Atomic Energy Commission, a post he has held since 1957.

Dr. Maxey, who is Director of the Center for Water Resources Research at the University of Nevada, Reno, was born in Bozeman, Montana and was raised in Livingston. His professional activities include teaching at leading American Universities and several U.S. Government foreign assignments in the related fields of geology and hydrology. He has authored and co-authored more than a score of publications including his manual of Hydrology, 1964; the impact of Public Law 88-379 on Hydrological Research and Training in the Universities, 1964; Hydrology and Water Resources Act, 1965.

Dr. Maxey received his Bachelor of Arts degree in 1939 from the University of Montana, Missoula; in 1941 he received his Master of Science in Geology from the Utah State Agricultural Colege, Logan; he was awarded a Master of Arts degree in Geology from Princeton University, Princeton, N.J. in 1950, and in 1951 he earned his Ph.D in Geology at the same University.

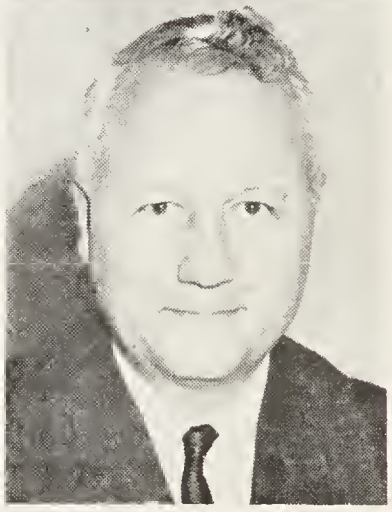
Earlier in his career Dr. Maxey worked from 1941 to 1948 with the U.S. Geological survey in Utah, Kentucky, and Nevada. He holds membership in many professional organizations including the American Association of Petroleum Geologists; American Geophysical Union; International Association of Hydrogeologists; and American Water Resources Association.

Before transferring to the University of Nevada in 1962, Dr. Maxey was employed as a Geologist and head of the Division of Groundwater Geology and Geophysical Exploration, Illinois Geological Survey, while at the same time serving as a professor at the University of Illinois.

Dr. Maxey is married to the former Jane J. Clow, a native of Lewistown, Montana; the couple have three daughters, Nelle Jane, Ann Dee and Permilla Jean; and two sons, Lee Burke and Dan Howell.

Water Planning for the Future

By Everett V. Darlinton, Director
Montana Water Resources Board



Since the condition of Montana's environment should be good enough to allow us to develop the optimum well-being of all our people, both now and in the future, this means that for all water uses, we must carefully plan for our future water needs. Our last Legislature considerably expanded our authority to conduct comprehensive, statewide water and related land resources planning. State funds were made available to us on July 1, 1967 which enabled us to undertake this important work and we have also received funds from the Federal Government under the matching provisions of Public Law 89-80.

Since practically all of Montana lies in either the Missouri or the Columbia River Basins, our agency has participated for a long time in Federal and regional planning conducted, in large part, by the Missouri Basin Interagency Committee, the old Columbia Basin Interagency Committee (now a River Basin Commission), and the Columbia-North Pacific Study. Much of the work done by these Committees, which includes a considerable contribution by our Board, as well as by other State and Federal agencies, will be used in our planning effort.

We also intend to use departments of the University System in Montana to develop certain basic models and studies which involve considerable research. For example, we are supporting the Bureau of Business and Economic Research at the University of Montana in Missoula on an economic base study. We are also discussing the possibility of having the Universities' Joint Water Resources Research Center at Montana State University in Bozeman conduct a computerized basins systems model study for application in the later phases of our plan. The purpose of such a project would be to computerize a lot of data and be able to tell what various developments within a river basin might do to its water resources through use of the computer and the answers it would quickly grind out. This is a new undertaking but we think it can work and we expect

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Edited by Norman J. Brown

(Continued From Page 1)

the new computer unit at MSU to help us considerably. In addition, we will rely heavily on the staff of the Montana Bureau of Mines and Geology in Butte, in conjunction with the Water Resources Division of the U.S. Geological Survey, to contribute material on ground water over and above that which we have already gathered in our office. Of course, the U.S. Geological Survey will also furnish data on surface discharge, and the quality, and temperature of Montana's waters.

At present we have developed the barest framework of a "water plan" but I think we have definitely decided upon four phases which form a rational and logical framework. These phases include:

1) An inventory phase which will result in detailed knowledge of our water resources and it will involve computerizing of all raw data in a storage and retrieval system which will allow easy and rapid use of data both now and in future phases of the plan.
2) A water needs and projections phase the results of which, when balanced against the water inventory, will allow us to recommend developments for the future based upon the availability of water. Concentration will be centered on the period up to 1980 for which relatively realistic projections can be made. However, we will give some attention to projections for the years 2000, and 2020 even 'tho we can't be very accurate for those dates, but this will keep us in line with other planning now taking place in the West.
3) The third phase will involve recommended developments to be accomplished by the target years 1980, 2000, and 2020.
4) The fourth phase is an implementation phase. This, of course, is actually doing something with our water resources and this will depend solely upon the wishes of our Governor and our Legislature. Our plans can be no more than a road map, or a guide, for them to follow in deciding how they want to invest funds and what they want done. The plan will have to be continually updated and implemented, and as I have mentioned, I do not feel confident about our projections to the year 2020, but as we go along, we will revise and project changes. Who would have guessed the rapid population increase which has come to California, if anyone had tried to project its growth not too many years ago?

During the next year we hope to accomplish the greater part of the inventory phase including cataloging and recording the information by computer and other devices and publishing summaries of the results so that the public, our Governor, our Legislature, and other planners especially, will be ware of our work. Specifically, we will publish a directory and report of the programs of all agencies interested in, or working in, the Water Resources field in Montana, an up-to-date bibliography of literature on water resources in Montana, a summary of the economic and legal aspects, a summary of reservoir sites, a summary of surface water data, a summary of ground water data, an inventory of water use, and a history of water planning in Montana. Other subjects to be covered later on will include soils and related land resources and present water needs, as well as a general statement of the water plan and how we intend to formulate it.

Any schedule for completion of our planning goals at this time would be premature. However, a very gross estimate of scheduling is as follows:

Phase I — Water Resources Inventory 1 to 2 years.
Phase II — Water Needs—2 to 3 years
Phase III — Recommended development (First approximation)—3 to 4 years.

The development and scheduling of the plan is based upon the assumption that other plans, both State and Federal, will be in an approximately similar, or even more advanced state in 3 to 4 years so Montana will need a developed plan in about this time in order to coordinate with other agencies and states in a meaningful way. Therefore, as you can see, we are faced with a definite deadline in the preparation of our water plan.

Another function of our Board, which has been underway for the past 24 years, is our Water Resources Survey and it will greatly assist us in preparing the water plan. In this survey, surface water right information is gathered by our personnel from each of the county courthouses where it is on file and we then make field studies to determine the actual use of the water and we map the land it is used on. We have added general information to the newest county reports concerning small reservoirs, soils which may prove suitable for irrigation, and general ground-water information. The past Legislature granted us additional funds to rapidly accelerate this program and we have now completed surveys on 40 of our 56 counties, although only 38 reports have so far been published.

Regarding the conservation and wise use of our water resources, I, for one, believe that the construction

(Continued On Page 3)

of many smaller sized, upstream storage reservoirs hold the greatest promise for Montana's future water development. Such reservoirs would catch much of our spring flood waters near their source (and these waters will otherwise surely be lost to us) and the reservoirs would hold the water for use later on in the year by agriculture, industries, municipalities, and recreation, fish and wildlife, when the stored water would flow by gravity from the high valley reservoirs down through our entire state before reaching our borders. I am convinced that this type of development is very necessary since over one-half of the yearly flow of our streams occurs during just the three months of May, June, and July. In addition to stored waters, detailed studies of Montana's ground water supplies will show us where the pumping of ground water may be the most economical, and perhaps the only, source of fresh water available to many areas of our state. Our Board believes that the construction of smaller sized, multi-purpose water projects can be accelerated in Montana through cooperation between our agency, Soil and Water Conservation Districts, the State Soil Conservation Commitee, and the Federal Soil Conservation Service under Public Law 566 wherein the Federal Government writes-off considerable sums of money depending upon how much value can be given to flood control, recreation, and other public benefits which the state does not have a means of funding at this time.

The majority of our Board's existing projects lie east of the Continental divide in the Missouri River Basin. This can be expected because we have vast areas of dry land in this Basin. In fact, nearly 8/10 of Montana's land lies in the Missouri River Basin but only 4/10 of our surface water is found there so, conversely, only 2/10 of our land lies in the Columbia river Basin but 6/10 of our surface water is there. These facts indicate to me that we should, in the future, consider the possibility of transferring water from our Columbia side to our Missouri side as Montana's water needs increase. Our State Water Plan will be co-ordinated by Dr. George (Burke) Maxey who became associated with the Water Board as Planning Consultant last month.

PROJECT INVESTIGATIONS

By Don D. Sullivan

Acting Chief Engineer

Water Resources Board

The Engineering Division of the Water Resources Board has either studied or is planning to study in the near future a number of water development projects, and where the projects are found feasible, they will be given serious consideration for early construction. Construction, of course, will also be contingent on the availability of necessary financing.

Following is a brief summary of some of these projects:

Boulder Project—Jefferson County

This project consists of a complete irrigation system, including a reservoir and distribution canals, to provide irrigation water to 8,000 acres of land in the Boulder Valley below the town of Boulder.

If a sufficient number of water users manifest a firm interest in the project, and construction funds are made available, there is a possibility that an additional 2,000 acres of new land, or land that is now in dryland crops, could be irrigated. There are 15 ranchers in the area who have petitioned the Water Resources Board and indicated a desire to purchase water from the proposed project. A project site was first investigated in the late 1930's by the Board in cooperation with the U.S. Bureau of Reclamation. Due to financing problems, however, the project was postponed. In 1960 an application was filed with the U.S. Soil Conservation Service (SCS) requesting a study and construction of the project under the Small Watershed and Flood Protection Act (Public Law 566). The SCS investigated the feasibility of a multipurpose reservoir site on the Little Boulder River near the Diamond S Ranchotel. The Board was asked to co-sponsor the project in 1965 and a right-of-way problem was encountered. In addition, further investigation by the Water Board indicated that there was a questionable foundation problem which could boost the construction costs considerably. Due to these problems, the Board feels that development of this site is very doubtful.

In the meantime, the Water Board has investigated two alternate project sites. One of these is upstream on the Little Boulder River; this site has been found to have excellent topographic features for a damsite. However, the foundation there proved to be questionable and extremely high in cost. The second alternate damsite on which the Water Board has made a preliminary study is situated approximately two miles above Bernice on the Main Boulder River. This latter site appears to require a structure with an elevation of approximately 135 feet and it would store about 20,000 acre-feet of water. Presently, the Water Board does not have necessary geological information on this particular site and, therefore, final feasibility has not yet been determined. The Water Board is hopeful, however, that the State Soil Conservation Committee and the U.S. Department of Agriculture's Soil Conservation Service can assist the Board in the investigation of this alternate site. If the site is found to be feasible, the necessary reports and documents can then be prepared for submission to Congress and the State Legislature for joint financing.

Sidney Project—Richland County

The Water Resources Board is also investigating, in cooperation with the U.S. Soil Conservation Service, this proposed redevelopment in Richland County. This existing project consists of three main pumping plants which supply water from the Yellowstone River to irrigate 3,223 acres. The original project was built in the early 1940's and presently the pumping plants and distribution system badly need rehabilitation in order to operate efficiently. Under the rehabilitation program, it is proposed to reconstruct two of the main pumping plants in their present location, construct one new main pumping plant and three re-lift stations to irrigate a total of 4,598 acres.

Thirty-four water users have expressed an interest in this project and the Water Board is presently working on the renegotiation of a power contract with the Bureau of Reclamation, as well as with the Lower Yellowstone Rural Electrification Administration for a power wheeling contract to deliver power from the Bureau of Reclamation's substation to the proposed pumping stations.

Willow Creek—Valley County

The Water Board regrets that construction of a proposed irrigation project on Willow Creek in Valley County has not yet been accomplished because of difficulties encountered in obtaining the total financing required.

The project was estimated to cost about $880,000 and the last Legislature appropriated $484,000 of this amount to the Board. The project, as originally proposed, consisted of a storage reservoir having a total capacity of 25,000 acre-feet. The dam would be located

(Continued on page 4)

on Willow Creek, and it would have a crest length of 1,080 feet, and a maximum height above the streambed of 90 feet.

The reservoir would furnish supplemental irrigation to 24 water users in the Hinsdale-Vandalia area. The water would be distributed to the water users through the existing distribution works of the Rock Creek Canal Company.

The Water Board investigated the possibility of obtaining Federal funds either under Public Law 566, under a Farmers Home Administration loan, or under an Agricultural Conservation Program pooling agreement but in each case, the U.S. Soil Conservation Service would have to approve the feasibility of the project. Due to previous committments of the SCS as well as to the time required to study the project by the SCS and then obtain Federal funds from Congress (if approved), it would be too late for Federal funds to be received before our State appropriation funds will revert to the General Fund on June 30, 1969. Therefore, because of these problems it does not appear possible to let contracts and begin construction on this project before our State funds revert.

Therefore, the larger landowners under the proposed project have indicated their desire to construct private pumping plants in the Milk River to obtain water for their project lands. The landowners feel that even if they do not obtain sufficient water for full development that they could justify a limited development for at least a couple of years if some water were made available to them. The remaining approximately 14 water users of the Willow Creek group are still vitally interested in developing the project and in investigating the possibility of obtaining Federal matching funds for construction from the Economic Development Administration. Although our agency has assisted this group in this matter, nevertheless, the final outcome depends solely upon the group's getting a top priority for this project from their local planning committee. If money is not available from the E.D.A., the Willow Creek group of 14 water users has indicated that they will request our agency to submit to the Legislature another request for construction funds in the amount of the total cost of the project.

Lake Creek—Beaverhead County

The Water Board received a petition from 13 ranchers in the Lake Creek area, near Wisdom, requesting an investigation of a reservoir storage project. Their proposal is to raise the existing Twin Lakes to conserve spring runoff for irrigation purposes in the latter part of the year. However, due to recent inclement weather conditions the Board has not yet been able to investigate the damsite. If preliminary studies indicate the project to be economically and technically feasible, the Board will make a more detailed investigation for possible presentation to the Legislature.

Daly Lake—Ravalli County

Also on our agenda for the not too distant future is a revision and updating of a previous engineering study on the rehabilitation of Daly Lake in Ravalli County. This is an existing reservoir in the Skalkaho Creek Drainage. The small reservoir was originally constructed under the Daly Ditches Projejct many years ago. It is proposed to rehabilitate and increase the storage capacity in the reservoir to meet the increased water demands under our Daly Ditches Project.

Groundwater Inventory

By A. J. Mancini, CPG

The Montana Water Resources Board at present is compiling data on the occurrence and use of groundwater, as part of a continuing comprehensive inventory of Montana's water resources. The inventory in Liberty, Toole, Glacier, Sanders, and Mineral Counties is being conducted in conjunction with the Water Resource Surveys in progress, under the general supervision of Mr. Hans Bille of the Water Board.

A groundwater inventory has also been started in Carbon County. This project includes an additional phase of collecting field data from specific areas within the county where local groundwater problems have recently been reported. The Water Board is being assisted in defining these by Mr. J. D. Dykstra, Chairman of the Carbon Soil and Water Conservation District.

Data is being collected in the field by two capable students from Montana Tech—Gary Knudson and his assistant Bradley Bruce. The two field geologists have the professional guidance of Mr. Robert Marsh, a Certified Professional Geologist (CPG) residing at Billings. This group will gather needed data and report their findings to the Board. The Board will use this data as part of the inventory and will attempt to assimilate all data in such a way as to provide a basis for the better utilization of Montana's groundwater resources.

Controlled Groundwater Area

Last year the Montana Water Resources Board established the first Controlled Groundwater Area in Montana. The area was established under provisions of the Montana Groundwater Code, and includes more than 100,000 acres of land along the western flank of the prolific oil-producing Cedar Creek anticline, in Townships 11-13N, Ranges 55-57E in Prairie, Wibaux and Fallon Counties. This area receives about 12 inches of precipitation in a normal year much of which evaporates before it can be used. Only a small amount of surface water is available for local use. Ranchers depend upon groundwater for almost all water needs, and the widespread Hell Creek-Fox Hills sandstones extending from Wyoming and the Dakotas into Montana are the major source of this water. The water is relatively fresh, and even though many wells were drilled more than 1,000 feet below the surface, the aquifers are artesian. Almost all the wells flowed when first drilled.

For the same reasons that ranchers found this an attractive source of water, the Shell Oil Company planned to use Hell Creek-Fox Hills water for waterflooding a portion of the Pine Oil Field. A pilot program using a relatively small amount of fresh water was started in 1962, and a full-scale water flooding project commenced shortly thereafter. As a result of the combined withdrawals by ranchers and the Shell Oil Company, a noticeable drop in water levels occurred. Some wells barely flowed or ceased flowing.

Ranchers in the vicinity of the town of Baker formed the Pure Water Control Association with Arthur McNaney as President and David Strobel as Secretary. The Association, as provided by the Groundwater Code, petitioned for a hearing on the use of Hell Creek-Fox Hills water. The Water Board conducted the public hearing in Miles City and heard testimony by all interested parties.

As a result of this hearing and a lengthy comprehensive examination of all pertinent data, the Board established a Controlled Groundwater Area. The order published by the Board limits the total withdrawal of Hell Creek-Fox Hills water and allows no additional drilling without prior approval of the Board.

Much of the data examined was collected by personnel of the U.S. Geological Survey during a detailed

(Continued on page 5)

investigation of the area as part of the continuing cooperative program of the U. S. G. S. and the Montana Bureau of Mines and Geology. Nine water wells within the controlled area were incorporated early into the investigation as important observation wells. Water levels in these wells have been measured periodically as part of the continuing surveillance of groundwater conditions. At the request of the Water Board several additional wells have been added to the program. Water-levels are now being measured monthly. Recent measurements by the U.S. Geological Survey indicate a general springtime water-level rise, with specific but as yet undefined fluctuations. This type of data is being collected to provide an understanding of the behavior of important artesian aquifers in Montana. Additional data is provided monthly by the Pure Water Control Association, the Shell Oil Company, and the Union Texas Petroleum Natural Gasoline Plant near Glendive, which also uses Hell Creek-Fox Hills water from one well for domestic and industrial purposes.

All the major water users have undertaken remedial measures to prevent the waste of groundwater. Ranchers have repaired leaking wells and are not allowing unregulated withdrawals from domestic and stock wells. The Shell Oil Company is renovating injection wells so as to be capable of utilizing a maximum amount of water produced with oil, and using Hell Creek-Fox Hills water only to supplement this supply. The Shell Oil Company, as directed by Mr. J.W. Zoller, the Rocky Mountain Production Manager, and supervised by Mr. C. L. Creiger, assistant to Mr. Zoller, is also cooperating with ranchers to improve water-well facilities in order to assure adequate fresh water supplies for domestic and stock use at all times.

Ground Water and Water-Using Mineral Industry Studies in Montana

By Dr. S. L. Groff and Charles Lane*

The study of ground water is not new in Montana. Both the U.S. Geological Survey and the Montana Bureau of Mines and Geology have been involved separately and together in ground-water investigations for many years. The relative status of ground-water data and control is in a much more ordered situation than that of surface water, though both surface and ground water bear an intimate association in their natural habitat. In the last few years, the need of the mineral fuels industry for guaranteed water supplies has caused the Bureau to look carefully at Montana's coal-water relations.

Cooperative Ground-Water Investigations

Investigations of the ground-water resources of Montana were first started around the turn of the century. These early studies were made by the U.S. Geological Survey to aid settlers in obtaining water supplies so that a stable rural population could be established in areas remote from the stream valleys. These studies were of a broad reconnaissance nature but were adequate for the time and the stage of development of the State.

During the dry years of the 1930's, Dr. E. S. Perry of the Montana Bureau of Mines and Geology made a number of brief reconnaissance studies of the groundwater resources of the State to encourage the development of ground water for municipal, irrigation, and industrial water supplies.

With the activation in 1945 of the Department of the Interior's program for development of the land and water resources of the Missouri River Basin, additional ground-water studies in areas associated with basin developments were made by the U.S. Geological Survey. These studies are still in progress on a limited scale and are limited primarily to the State's Indian Reservations and selected areas associated with project construction.

Following World War II and the Korean War, the State's population and economy began the expansion that is still in progress. Personnel of the Montana Bureau of Mines and Geology recognized that to meet the needs for water supplies in areas that were not served by adequate surface water, additional information on ground-water availability was needed as rapidly as it could be obtained with the limited funds available. In 1955, a cooperative program for ground-water investigations between the Bureau and the U.S. Geological Survey was initiated. Under this program, costs of investigations are shared on a 50-50 basis by the two organizations. Planning of the investigations and establishing priorities and time schedules is accomplished by the Bureau in conference with the Geological Survey. The field work associated with the studies is conducted by Geological Survey personnel, but the two organizations work very closely during the progress of the work. Reports on the results of each study are prepared and are published and distributed by the Bureau.

Work accomplished under the cooperative program to date includes investigations and published reports on the Bitterroot Valley, Deer Lodge Valley, Missoula Valley, and North Flathead Valley in western Montana. In eastern Montana studies have been completed in Blaine County, parts of Musselshell and Golden Valley Counties, the western and southern parts of the Judith Basin, along the Cedar Creek anticline, the Cut Bank area, and the northern Powder River Valley.

Investigations are currently under way in the Tobacco Plains area of northwestern Montana, the eastern Judith Basin, central Powder River Valley, and the Yellowstone River Valley in the Billings area. In addition, a Statewide network of observation wells in the principle water producing formations of the State is measured regularly to provide historic data on groundwater levels. This network should prove more valuable as time goes on in documenting changes in natural ground-water conditions as development of the resource proceeds, as it surely will. Without such data, administration of the State ground-water code to settle disputes would be severely handicapped.

By utilizing Geological Survey personnel and equally sharing the cost of the program, the Bureau has had access to the facilities of that organization and a nationwide pool of trained water resources personnel including engineers, geologists, hydrologists, chemists, and geophysicists.

Independent Ground-Water Work of the Bureau

In addition to the cooperative program, the Montana Bureau of Mines and Geology has conducted reconnaissance-type groundwater studies of its own. Some were made by the Bureau staff, while others were completed under a program designed to train graduate students. At present, the Bureau's hydrogeologists work through the Water Resources Research Center on a number of groundwater research projects, and are also engaged in teaching and training hydrogeologists at Montana Tech.

Areal groundwater investigations are now made by the Bureau only as a part of the graduate student research program or at the request of another agency, such as the State Highway Department, Water Resources Board, Fish and Game Department, Oil and Gas Conservation Commission, or a municipality. The

(Continued On Page 6)

Bureau maintains a competent staff of hydrogeologists and is acquiring the modern equipment to meet its varied obligations to the State. These obligations include continuous research to improve and speed up groundwater investigations, and even here, good advisory realtions are maintained with the U.S. Geological Survey. The answering of inquiries, working with water well drillers, writing reports, and researching computerized water data processing systems are all routine to the Bureau hydrogeologists. Finally, the Bureau maintains a file of all available groundwater information and basic data for Montana.

The Mineral Industry and Water

The Ground-Water Branch of the Montana Bureau of Mines and Geology has advised the mineral industry relative to water supplies for many years. Examples of this would be the Bureau-Geological Survey's work with Waldorf-Hoerner in the Missoula Valley, Kaiser-Permanente's water supply south of Helena, and statements by the Bureau at hearings of the Oil and Gas Conservation Commission relative to water uses by the petroleum industry.

More recently the Bureau's Mineral Fuels Branch has been active in evaluation of Montana's vast strippable coal resources. Starting with Montana's First Coal Symposium, the Bureau worked to organize the Montana University System Coal Resources Research Council. Following the organization of the Council, a modest grant provided by the 1965 legislature enabled the Bureau to implement a joint strippable coal evaluation program with the Northern Pacific Railway Company. A coal geologist was hired, equipment was obtained, and pertinent data was assembled. During the 1966 field season, the 600 million ton Foster Creek lignite field was evaluated. Another modest appropriation enabled the Bureau to field two coal evaluation crews during the 1967 season. Compilation of the 1967 field data revealed the existence of a billion ton strippable reserve in the Otter Creek subbituminous field and a 500 million ton strippable reserve in the Broadus lignite field. Additional field work by the Bureau's independent crew showed that previous reserve estimates by the older U.S. Geological Survey investigations were conservative and that all strippable reserves were greater than previously believed. Preliminary study of the Moorhead field north of the Wyoming boundary and west of Powder River has promoted an optimistic view that at least another billion tons of strippable coal is present in this field. It is anticipated that the Moorhead field will be drilled and evaluated during the 1968 field season, and some initial evaluation will be carried out in McCone County.

Present and anticipated strippable reserves in the eastern half of the Powder River Basin are listed as follows:

Otter Creek	1.0 billion tons
Pumpkin Creek	1.3 billion tons
Foster Creek	0.6 billion tons
Moorhead	1.0 billion tons*
Broadus	0.5 billion tons
Other fields	0.6 billion tons**
Total	5.0 billion tons

*anticipated
**low estimate

Availability of water supplies constitutes a necessity in the development of these resources. Other deposits, such as those at Savage, Wibaux, and even Colstrip, are now or will be utilized by transport of the coal to a use-site near the Yellowstone River. The deposits in the preceding list, however, are at a considerable distance from the Yellowstone, and the problem of water supply becomes acute. The Powder River does not maintain sufficient perennial flow to permit industrial use. Therefore, the Montana Bureau of Mines and Geology has suggested to the State administration that every effort be made to promote Moorhead Dam on the Powder River.

Another interesting water-coal association exists in McCone County. In this area, the Bureau believes that up to 3 billion tons of strippable coal may be available. The cities in McCone County have water supply problems, and irrigation is virtually nonexistent. Several Montana legislators and some of our Washington delegation have a critical interest in developing a large water-using industry in McCone County, so that pumping water from Fort Peck Reservoir would become economically feasible.

In a general sense, it now appears that Montana's water and coal association may well initiate a "boom" in the State's mineral economy.

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* Dr. Groff is Professor of Geology, Montana Tech, and Chief, Ground-Water and Mineral Fuels Division, Montana Bureau of Mines and Geology, Butte.

* Mr. Lane is District Chief, Water Resources Division, U.S. Geological Survey, Helena.

Economic Base Study
By Dr. W. D. Diehl, Director
Bureau of Business and Economic Research
University of Montana

The Montana Water Resources Board entered into a three-party contract in March, 1968 wtih the Bureau of Business and Economic Research of the University of Montana to make an Economic Base Study for the state. The Department of Planning and Economic Development is also a party to the contract. These three state agencies through mutual agreement have pooled some of their funds to match with federal grant funds provided by the Department of Housing and Urban Development. Work is expected to begin next month on the study.

An Economic Base Study is a study describing the state and areas within the state in terms of economic activity including population, households, labor force, employment, productivity and income. It is designed: (1) to trace the historical development of the state's economic system; (2) to trace the forces that have been influential in molding the present-day economic structure and the economic characteristics of the state and its areas: and (3) to identify and evaluate strengths and weaknesses in the state's economy.

The major operational problem is that much of the data necessary to understand the economic and social processes in the state are available only on a decennial basis. Changes are occurring so rapidly and the needs for knowing the changes are becoming so vast that a considerable increase in effort to provide such data and analysis is needed.

The Economic Base Study is designed to fill these gaps in a way that will provide a complete annual profile of the state's economy and the economies of areas within the state. It is also designed and funded to make significant steps toward the establishment of a data and information system which will serve the legislature, state agencies and local governmental units as well as the private sector. The basic core of uniform economic information on the state and areas of the state will serve as a basis for making rational judment from a common set of data and information about Montana resources.

Some of the end products of the Economic Base Study will be:

(Continued on page 7)

(1) Annual Economic Report of the Governor

The Economic Base Study will result in an annual summary of major state and regional population, employment, and economic developments submitted by the Governor to the people of the state. It will include an analysis of economic growth during the year and its relation to the state's fiscal situation. Besides containing an annual data series on the state the report wil include interpretive materials covering important changes in the state's economy.

(2) Special Forecasts and Studies

The Economic Base Study will serve as a basis for special studies and forecasts such as fiscal studies and projections, detailed population and income forecasts, and special studies in housing, consumer credit and finance, income distribution, transportation, natural resources, education, taxation, recreation and tourism, and others.

(3) State Government Economic Development Promotion

The Economic Base Study will provide the State Department of Planning and Economic Development with a more analytical approach which will result in a more efficient use of its industrial promotion resources. By means of locational analysis the types of economic activity best suited to particular areas can be identified. For example, labor force, transportation facilities, water availability, energy availability, and other resource requirements for successful business location can be made readily identifiable. Also, the economic base study will identify for each locality the industries with "high pay-off" in terms of income and employment.

The Economic Base Study will also assist private business in planning for successful capital investments.

Federal, state and local governmental programs and functions play a vital role in economic development. This is evident through activities of government in taxation, elementary, secondary and higher education, transportation, natural resources and recreation. The developments in these areas of government activity were based on the necessity to meet human needs. By and large these human needs are an outgrowth of the size and makeup of the population at any given time and the activities of its members as producers and consumers. It is the function of the Economic Base Study to provide reasoned insight into the nature and extent of these production and consumption activities and based on this insight, to make calculated projections of their future growth for use in determining the amounts, kinds and timing of desirable government programs and activities.

Obviously the activities of government at all levels affect in a very significant way the business community also. Governmental decisions in water resource development, recreation, education, taxation and transportation will in some cases determine the nature and extent of private enterprise activity. Without a study of this kind we cannot determine the potential influence of governmental decisions on private enterprise and therefore on state economic growth and stability as it is influenced by private enterprise activity.

Agricultural Water

By C. Lowell Purdy, Commissioner of Agriculture

Certainly agriculture should be given first and paramount consideration in developing plans for the future use of Montana water. Agricultural income is by far the major contributor to the State's economy; this income is approximately double that from mining and some four times that of the lumber industry.

Agricultural development through increasing use of water certainly will be one of the State's most stable contributors to economic development.

The value of irrigation water was most apparent during the drought-stricken, depression days of the 30's. It was during this period that the state of Montana began an irrigation and water program. Most of the projects that were feasible at that time, have now been completed and, of course, were paid for by irrigators.

Future Development

The many watershed projects that can and should be built in the future are simply too expensive to be financed strictly by the agricultural user. The problem now is to effect mechanisms through which our water resources can best be developed for multiple uses. Planning now must consider the uses of water for municipal and industrial development, fish and wildlife, recreation and flood control. Only through the sharing of costs by those various users of water, is development of projects possible.

The fantastic population explosion throughout the world will eventually necessitate the optimum use of each acre of tillable land. It is anticipated that the population in the United States itself will increase from the present 200 million to 330 million in the few short years between now and the year 2000. The west is the fastest growing area, and in the Pacific Northwest States the population of 6 million is expected to double to 12 million during this period. Considering these population figures and the fact that the total land available for food production will remain static, it is quite apparent that to meet the food challenge of the future, we will have to do rather well in blending our land and water resources. Instead of surpluses, it is logical to reason that we will be faced with food shortages, and any so-called remaining crop surpluses are in reality reserves.

Land Development

More and more idle arable land will have to be brought into production and more of this land will, of course, be irrigated. We irrigate roughly 40 million acres of land in the United States and over 90% of this land is in the western states. Montana is, of course, the headwaters for a large portion of the water that is used for irrigation purposes in the western region. As the demands on water for agricultural, municipal, and recreation uses become greater, more and more pressure will come from other states for more of Montana's water. It would not be feasible or desirable for us to attempt to preclude the use of Montana water in these areas. We can and must, however, take concrete steps to insure that enough of the water will remain to take care of future needs and developments in Montana.

Much interest and discussion has transpired in recent years by countless water groups within the state and the last session of the legislature appropriated funds to the Water Board to inventory and study water needs. A water conservancy bill was introduced in the legislature but failed to pass. I am certainly not an expert on water law, but it does seem that it would be a step forward to get some legislation on the statute books that would hasten the multiple use development of water in Montana. Even though the law was not perfect, it would be a start. Construction of small multiple-use projects, it seems to me, is the most sensible and logical way to preserve and insure the use of Montana water within the state.

A COMPUTER MODEL FOR MONTANA'S WATER PLAN

by Dr. Roy E. Huffman
Vice President for Research
Montana State University and
Director, Montana University Joint
Water Resources Research Center

The Montana Water Resources Board was charged by the 1967 Legislature with the responsibility of developing a State Water Plan. An effective water plan is not merely a set of goals, however, but must also provide a management tool for the future. The requirement of (1) adequate information as a basis for planning, (2) objective determination of goals, and (3) management of an operating system is not a simple problem. The complexity of developing a State Water Plan has increased greatly as the requirements of an urban-industrial-recreational oriented society must be recognized in addition to the traditional requirements of agriculture.

Preparing a State Water Plan will require a large amount of information of many kinds. The situation can be simplified by dividing the needed data into two categories. One category will include information regarding the physical supply of water, both surface and groundwater; the relationship of water supply to the management of watersheds; and the alternatives available to increase the useable supply of water through storage and other developments. The other category will include information regarding the present amounts of water used for all purposes; projects of expected population growth and economic development; and estimates of water requirements at various future dates. When these factors are included in an analysis, it is possible to determine the benefits and costs involved in alternative water resource developments.

It becomes obvious that the Water Board and its staff will face a difficult task of organizing, sorting out, and evaluating a large volume of data. All of this must be made meaningful in terms of planning for the future use of Montana Water. The Water Board and its staff could easily be so overwhelmed with the volume of information at hand that the typical factors of emotion, tradition and group pressures may end up as the dominant influences in decisions. Use of mathematical formulations and computer analysis can provide a tool for handling the vast amounts of information that should guide the planning process. Without entering into the complexities of the mathematical and computer techniques involved, it can be said that the use of a State Water Planning Model makes it possible to "try out" alternative possibilities for water resource development, use and management before any actual commitment of funds is made or any construction is begun. It should be emphasized that the Computer Model does not make decisions but provides the basis for better decision-making by demonstrating the alternatives available. The responsible officials of the Water Board make the decisions and are also able to give consideration to qualitative factors that are not included in the Computer Model because they cannot be quantified.

It is logical that the means of handling the data (the Computer Model) be developed in parallel with the collection of data through the State Water Plan and the State Economic Plan so that the two will fit together. For that reason, the Department of Civil Engineering and Engineering Mechanics and the Department of Industrial and Management Engineering have proposed the development of a Computer Model for the Montana State Water Plan with the research to be carried on through the Montana University Joint Water Resources Research Center. A grant in the amount of $111,150 has been awarded to the Water Center by the Office of Water Resources Research of the Department of the Interior to develop such a Model during the next three years. To be used, this grant must be matched with an equal amount of state funds. At this time, the logical source is through the funding appropriated to the Water Board for development of the State Water Plan.

APPROPRIATIONS

By a voice vote the House of Representatives passed the Public Works Appropriation recommended by the House Appropriations Committee but put a $4.4 billion spending lid on the total. The committee report pointed out that of the total only $1.4 billion would go for water and power resources development. The committee report warned that a "most costly and inefficient crash program" to catch up with the nation's water needs lies ahead if current fiscal problems result in continued drastic curtailment of water resources projects.**

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MONTANA WATER RESOURCES BOARD

Vol. 1—No. 1 NEWSLETTER March, 1968

This is the first edition of a quarterly newsletter to be published by the Montana Water Resources Board. It reviews some historical background, activities and responsibilities of the Board. It also contains, as will subsequent issues, material contributed by others concerned with water conservation and development.

Board Origin

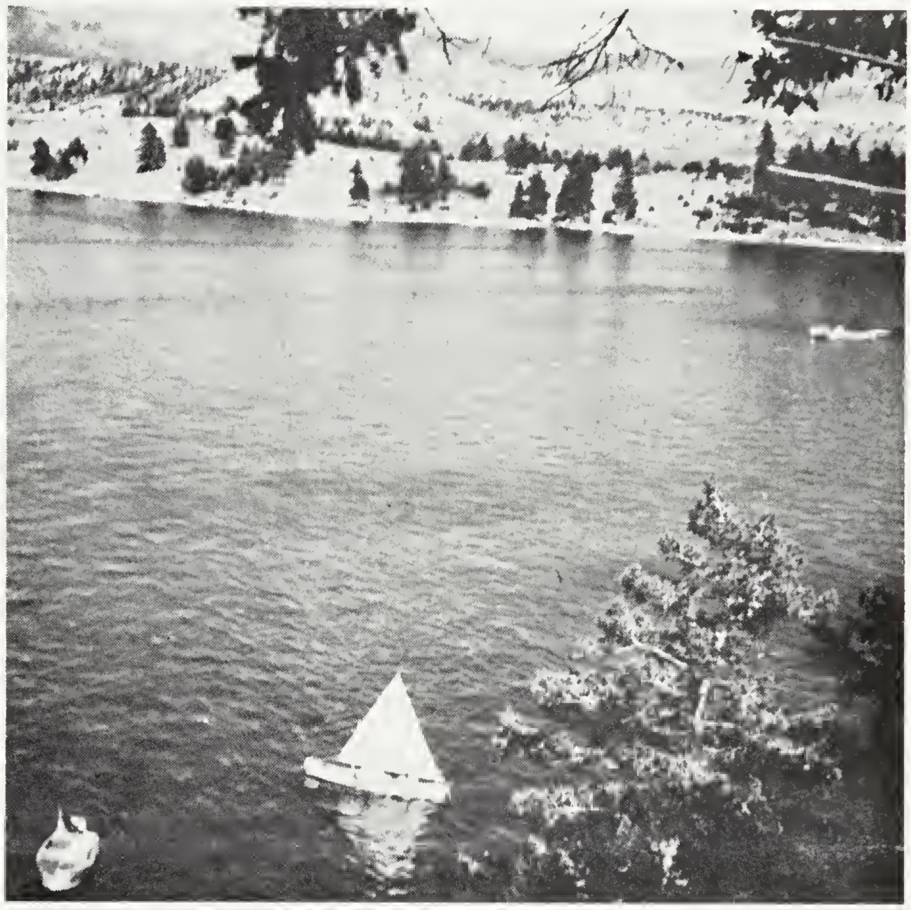
The State Water Conservation Board was established in 1934 by the State Legislature. In 1965 the Office of the State Engineer was abolished by the Legislature, and all of its duties and responsibilities were transferred to the Water Board. The 40th Legislature changed the Board's title to its present designation under the Water Resources Act of 1967. Last July, Governor Tim Babcock appointed Mr. Everett V. Darlinton as the Board's Director, succeeding Mr. Alex D. McDermott who was named as the State's alternate representative on the newly formed Pacific Northwest River Basins Commission (PNRBC). At the same time, Mr. James E. Murphy, Kalispell Legislator, was appointed as the State's representative to the PNRBC. Mr. McDermott remains as one of Montana's three representatives on the Western States Water Council. The two other Montana representatives on the Council are Mr. Clyde Hawks, St. Xavier, and Mr. Wesley D'Ewart, Wilsall, who is the State's member on the Council's Executive Committee.

Projects

Since 1934 the Water Resources Board has participated in the construction of 181 storage and diversion projects in Montana, providing irrigation water for more than 400,000 acres of land (Montana presently has about 2.5 million acres of land under irrigation and another 15 million under dry-land cultivation).

Multipurpose Use

The Board's larger storage projects originally constructed for irrigation, have become heavily adapted to water-based recreation, and some flood control. Planning and development studies recognize the emerging importance of the latter two water uses. In some instances our projects have furnished municipal water supplies. In several instances the State Fish and Game Department has cooperated with us through the Bureau of Outdoor Recreation where we have constructed and installed sanitary facilities in recreation areas of Board water projects.



Reservoirs Provide Outdoors Recreation

Concern With Water

Montana's water supply is increasingly becoming a matter of grave concern to Montanans, and concurrently it remains constant as a focal point in future water resources planning by other areas. Therefore, Montana is preparing to embark on one of the most ambitious water conservation and development programs attempted in many years.

The last Legislature considerably expanded the Board's planning authority, and appropriated funds for the preparation of a state-wide Water Plan and Ultimate Needs Study. Also appropriated were funds for an engineering study on the feasibility of enlarging an existing storage facility on the Tongue River in southeastern Montana. It is in this area where vast coal deposits have generated lively interest among coal processing companies and power interests, both of whom require large amounts of water for their operations. It

(Continued On Page 2)

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Anyone wishing to submit written material for publication in this Newsletter is requested to do so reasonably well in advance of publication date. The Board reserves the right to edit all material to conform with space limitations. This publication is distributed free of charge, and names will be placed on mailing list upon request.

Edited by Norman J. Brown

(Continued From Page 1)

is the Board's opinion that although agriculture has a vested interest in our water, there should be water available in the Tongue River area for both agriculture and industrial development.

In cooperation with the Water Board, several state agencies have suggested certain elements which they feel should be included in a State Water Plan. As part of this plan the Board and the Department of Planning and Economic Development have entered into a joint contract with the Bureau of Business and Economic Research, University of Montana. The Bureau will undertake an Economic Base Study of the State. This state-federal project is being financed both with state funds and matching money from the Department of Housing and Urban Development. Montana State University, Joint Water Resources Research Center, Bozeman, has proposed setting up for the Board a computerized river basins planning program. Meantime, other studies and activities of Water Board personnel are being correlated into the preliminary framework water resources study. As various phases of the plan evolve, they will be presented to the public for review prior to final adoption by the Board.

Montana's surface water rights are administered by the District Courts but the Board administers the Ground-Water Code. Last year, after a public hearing on a petition by a group of ranchers near Baker, comprising the Pure Water Control Association in eastern Montana, the Board established the State's first Controlled Ground-Water Area. The ranchers had contended that their well water was being damaged by excessive water withdrawals by an oil company who is engaged in secondary oil recovery by water flooding. Both the ranchers and the company draw their water supplies from the same aquifer.

As administrator of the **State's new Weather Modificataion Law,** the Board will screen all applicants seeking to engage in weather modification or control in the State as to their scientific qualifications and financial responsibility. The Board will hold public hearings in the affected areas to determine whether a majority of the people desire the project. To assist in administering this law, the Board will employ the services of a three-man advisory committee, two of whom already have been appointed; the two appointees are Mr. Richard Dightman, Head of the U.S. Weather Bureau, Helena, and Dr. Arlin B. Super, Associate Professor of Meterology, Montana State University, Bozeman. The third committee member is yet to be named. The Board retains membership on the **Montana Water Pollution Council,** and always has maintained an active interest in abatement of water pollution.

The Board also maintains a membership on the Montana Water Well Contractor Licensing Examining Board.

The Water Resources Board pays Montana's share of the expenses incurred in the operation of the Missouri Basin Inter-Agency Committee and of the Pacific Northwest River Basins Commission.

Presently the Board is cooperating in a joint state-federal planning and development study in both the Missouri and Columbia River Basins with the two last named agencies.

Engineering

Don D. Sullivan, Acting Chief Engineer, is charged with the engineering design and construction of new projects, and has responsibility for the maintenance of Board projects in cooperation with numerous water users' associations who purchase water from the Board projects.

Under certain circumstances these associations obtain financial assistance for repair and construction work through such federal programs as the Agricultural Stabilization and Conservation Service (ASCS), and the Agricultural Conservation Program (ACP), among others.

Maintenance

Flood repair work on the Delphia-Melstone Canals near Melstone was completed by the Balock Construction Co. late last fall at an estimated cost of $66,400. The engineering and construction inspections were carried out by the Board's Engineering Division. The work

(Continued On Page 3)

is being financed through a co-operative program between the USDA-ASCS (Agricultural Stabilization Conservation Service) which is paying 80 per cent of the cost, and the Delphia-Melstone Water Users' Association who is paying the remaining 20 per cent through the Water Resources Board. The Schieffer Construction Company, Billings, under contract to the Petrolia Water Users' Association, lined 10,157 lineal feet of an irrigation canal with concrete for water conservation. Such linings prevent the loss of water through seepage and, in this instance, an estimated 200 acres of water-soaked land can be reclaimed. The engineering design was done on this particular project by the Soil Conservation Service, and construction inspection was by the Board's Engineering Division. This work was on a cost-sharing basis through the Agricultural Conservation Program (ACP).

Self-Propelled Excavator
Deepening Petrolia Canal

Project Supervision

Operation and Management

Mr. William D. Morton, Board Project Supervisor, handles water use contracts, and keeps a constant physical check on project canal and dam conditions. In cases where modifications or repairs are required, these are reported to the Chief Engineer for action. Mr. Morton is in constant contact with all Water Users' Associations, and as liaison officer receives and passes on to the proper authority requests for financial assistance and the proposed terms of repayment to the Board for any monies advanced. Mr. Morton keeps track of weed control and/or other debris in Board canals and irrigation ditches.

Another function of the Project Supervisor is to attend all annual meetings of Project Water Users' Associations, and other special Association meetings by invitation. Measurements of water deliveries is also under the supervision of Mr. Morton.

Mr. Melvin F. McBeath, assistant to Mr. Morton, and field crews have installed to date more than 30 water measuring recorders on Board projects throughout the State. The recorders provide a record of water delivered to Board projects and are checked every two weeks; the devices are serviced at the same time. In addition to keeping records of water deliveries, Mr. McBeath also checks the air and water temperature readings when taking the streamflow recordings. The data collected is then tabulated and is released to the individual project users or other interested parties. Mr. Morton reports that several water measuring devices will be installed on different projects starting this spring.

Soils Survey

The Board's Land Classification Section this past year, under the supervision of Soils Scientist Glenn R. Smith, has conducted extensive field investigations relative to classifying all of the land area of the Columbia River Basin lying within the boundaries of Montana. This survey is designed to locate and identify all acreages that will economically produce satisfactory crop yields under a sustained irrigated agriculture. This survey is an essential element in the Board's Comprehensive State Water Planning Program.

Aerial photographs and U.S. Geological Survey Maps are used to aid in identifying the land areas under investigation. The soil topographic and drainage features are analyzed and the land classes are placed onto the aerial photos. This type of investigation is necessary to Montana's determination of water needs for potential irrigable acreages, and it will also be of value in identifying land areas for future project planning. The Land Classification Section of the Bureau of Reclamation, Columbia Basin Development Office, Spokane, Washington, cooperated on some phases of this survey. Included in the study for possible future projects are the arable acreages of a Burnt Fork Project in the Bitterroot Valley, and a Stillwater Project in the Upper Flathead Valley.

Also lending assistance in this work was the Soil Conservation Service whose published land surveys proved helpful in conducting the field studies. Correlation of Soil Conservation Service soils surveys with our land classification studies was made possible by field-mapping all of the areas involved. However, additional mapping will be necessary once the feasibility of projects is determined and a detailed study is made. Before any irrigation project is developed, it is desirable to thoroughly investigate the soil and drainage features to insure a satisfactory project.

Ground Water

A comprehensive **inventory of all ground-water resources** in the State, now being under taken by the Water Resources Board, is the primary concern of the Geologist A. J. Mancini, but he is also charged with providing technical assistance as may be required in other phases of ground-water and surface water management.

This inventory is of special significance to Montana where half the population live in rural areas, where numerous communities depend either wholly or in part on ground water for municipal supplies, and where a thriving livestock industry is successfully sustained

(Continued On Page 4)

largely on ground water. The Geologist's specialized training and experience are also called into play in dealing with investigations and reports on petitions for controlled ground-water areas. In addition, the Geologist's department keeps records of all groundwater appropriations and well-completion filings, all of which have been compiled into cross-indexed hardcover volumes. Also being compiled are water data collected from thousands of deep-well records of the State Oil and Gas Conservation Commission. All of this material is available for public inspection in the Helena offices of the Water Resources Board. The Geologist also has been designated as Montana's representative on Ground-Water-Hydrology Task Force Work Groups in both the Missouri and Columbia River Basins. These groups are part of State-Federal Committees engaged in appraisals of water resources and related subjects throughout the entire basins.

As the Board Geologist, Mr. Mancini represents the agency on such occasions as a Seminar on Ground-Water Basin Management late last year at the Engineering Extension and the College of Engineering, University of California, Berkely. The seminar included a lecture series by nationally recognized experts in the field of ground water. Lecture subjects involved such topics as fundamental concepts on the occurrence and movement of ground water; safe yield and overdraft, artificial recharge, economic considerations in management, legal considerations, etc. The seminar was attended by 125 professional engineers and hydrologists, including several foreign participants.

The seminar covered a broad spectrum of groundwater managemnt and problems including basic fundamental material useful in the day-to-day administration of Montana's Ground-Water Code.

Water Resources Survey

The Board's Water Resources Survey Division has been conducting a statewide inventory since 1943 of Montana water rights, water uses, and mapping the irrigated land upon which the water is being used, Mr. Hans L. Bille, Survey Division Supervisor reports. This survey, Mr. Bille says, is the first of its kind to be undertaken in any of the 17 Western Reclamation States.

This survey will also become an integral component of the Board's State Water Plan as the latter develops. To date the survey has been completed in 38 of the State's 56 counties. These 38 counties have an aggregate of 1,875,447 acres of irrigated land, and 369,041 acres irrigable under existing ditch systems, says Mr. Bille. Combined, this makes a maximum of 2,244,488 acres under irrigation facilities; of this amount 1,817,643 acres are in the Missouri River Basin, and the remaining 426,845 acres are situated in the Columbia River Basin of Montana. Estimating irrigated acreage in the State's 18 counties still to be surveyed, all irrigated land in Montana totals morethan 2.5 million acres. Compilation of the data gathered in the water resources survey of Hill and Blaine Counties was completed last summer and the published reports of these surveys were ready for distribution at the year's end. The **field survey** work in Phillips and Valley Counties was completed last summer and the data and related mapping will be compiled this winter in the Board's Helena office. It is anticipated that the **published reports** on these two counties **will be completed in the fall of this year.** Present schedules call for **completion of all of the counties by the end of the year 1972.** The net results of the Water Resources Survey will constitute the most complete existing inventory and record of water rights, water uses, landownership, and maps showing the irrigated land upon which the water is being used in the State.

Basin Studies

Tom Armour, Economic Analyst, A. J. Mancini, Geologist, and Tom P. McNulty, Agricultural Coordinator, are among the Water Resources Board personnel who are representing Montana on Work Groups and Task Forces of the Missouri Basin Inter-Agency Committee (MBIAC). The MBIAC groups are conducting a coordinated comprehensive study of the water and related land resources in the Missouri Basin. Some of the elements of the study are nearing completion and, Mr. Armour reports they probably will be available for distribution in late 1968. He also reports that a target date of June, 1969 has been set for completion of the entire MBIAC study. The over-all purpose of the Basin study is to gather and evaluate data pertinent to the planning, conservation and development of water and related resources in the basin.

As a member State of the Pacific Northwest River Basin Commission, the Water Resources Board also has personnel participating in similar studies in the Columbia Basin.

By Frank H. Dunkle, Director
Montana Fish and Game Department

Surveys indicate our greatest asset in attracting fishermen is Montana's trout streams. Consequently, our major task is providing streams that will produce trout for residents and nonresidents alike. There is no other state in the nation that can compete with our existing and potential trout stream fisheries. Emotions cannot be the dominating factor in water development. We, in the recreational field have some solid practical recommendations to make on development . . given the opportunity, I feel strongly that our recommendations can be worked into any project . . at a significant advantage to the total project and at a minimum cost. Practicality starts with mutual recognition of the other fellow's problem and an honest, straightforward approach to solve the problem in the best interest of all parties . . Perhaps there are ways that we can help one another . . and I predict we will see this fight either together or alone through the federal courts where legal recognition will take on a lot more importance. I don't think any single or limited coalition is going to adequately preserve Montana's right to its water. The

(Continued On Page 5)

job will be tough enough if we all pull together . . I am not speaking of water used solely for fish and wildlife, but water that fish and wildlife can also use because other interests have returned it in a condition that still supports game fish. This could be water used by industry but returned cool and clear—or water used by agriculture but returned silt free—or water stored in a reservoir that both supplies irrigation ditches and also keep streams alive twelve months a year. In other words, we would have a variety of uses that complement one another, rather than compete with each other and always gain at the expense of one over the other . . Now is the time to begin a true working relationship based on a proper statewide water use program that gives consideration to all water uses—a state program that considers all needs for state projects . . as well as those for federal projects.

There are at least three steps, as I see it, for all interest groups to face up to:

1. All legitimate water uses must be given legal recognition as beneficial use of Montana's water. I am not thinking just of Fish and Game—I am thinking of all water uses. To do this, it will be necessary for all of us to support this philosophy—this theory—and see that it becomes a fact. Here is the very basis of statewide water planning.

2. A statewide plan must be developed that shows Montana's intent to, first, recognize the needs for her water and, second, to show that this water is being properly utilized. Without setting down on paper our recognition of our needs and uses for water, we will be prey to all other water users outside of Montana. In addition to this, many interest groups within Montana will be excluded and unrecognized.

3. The final step, then, after the recognition of uses and planning for the needs is an open discussion of each project that may be considered. I don't feel that each project can be all things to all interest groups; however, it has been demonstrated in Montana that most interests can be served if we are working toward one goal —that is, unity of effort to properly protect Montana's water for Montana's users first. I don't mean to imply that we begrudge our water to our neighbors, but we do begrudge their using it before we have a chance to use this water to serve Montana's needs.

Let me suggest, as an experiment in unity of effort and as a means for other organizations and mine to get used to working with one another, that we select and concentrate on a project where all of us might benefit. Let's work together supporting a project where irrigated agriculture, fish, wildlife, and recreation could be served.

I'm for having a "go" at a real concrete attempt to achieve this unity of effort that is so easy to talk about, but so difficult to accomplish.

By Ole Ueland, Executive-Secretary
State Soil Conservation Committee

The State Soil Conservation Committee is the State agency designated by the Governor to approve applications for federal assistance under the Watershed Protection and Flood Prevention Act Public Law 566. This program is administered by the Soil Conservation Service of the USDA.

Soil and Water Conservation Districts are organized under the State Soil and Water Conservation District law which is administered by the State Soil Conservation Committee. These Districts have signed working agreements with the Soil Conservation Service whereby technical and other assistance is provided to cooperating land occupiers of the district.

The State Soil Conservation Committee and the Soil Conservation Service work through the districts which comprise the legal entities at the local level for conservation programs.

Applications for a P.L. 566 project usually originate with a Soil and Water Conservation District as a sponsor together with cooperating local groups or entities. The primary purpose must be for flood prevention, or agriculture water management, (irrigation, drainage, etc.). Other purposes which may be added are water for recreation, fish and wildlife, municipal and industrial uses.

These applications are then presented to the State Soil Conservation Committee for approval by the sponsoring groups. The State Soil Conservation Committee will consider the merits of the proposed project in several respects: (1) flood prevention benefits; (2) conservation of water for the public welfare; (3) multipurpose uses; (4) benefits more than a few individuals; (5) land treatment of the watershed; (6) economic justification.

This is a highly popular and competitive program. Thus, consideration is given to whether the local people are ready, willing, and able to act; also, as to whether an emergency exists to protect land and people.

The State Soil Conservation Committee establishes two priorities: First, there is a preliminary investigation in which basic facts are gathered on the feasibility and cost-benefit ratio. Upon completion of this preliminary step, the Committee attempts to obtain from the sponsors reasonable assurance that they are able to meet such prerequisites as acquisition of easements, contract agreements, and financing; after establishing this first priority, the results are reviewed with the sponsors, and if it is shown that they have the proper organization, and there exists sufficient interest to follow thorugh, a priority is then given for a detailed plan.

The Soil Conservation Committee attempts to make an on-the-ground investigation of, or visit to, each proposed project from time to time so as to be able to better judge the priorities. A continual review is carried on while the local sponsors manifest sufficient interest and are developing their organization.

Even though the P.L. 566 program offers planning and cost-sharing services to a project, a great deal of assistance and encouragement is extended to local spon-

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(Continued From Page 5)

sors to explain the benefits to local people, to arrange for a proper legal organization, to arrange financing, etc. There are a variety of details involved in planning and building a multipurpose project in which the State Soil Conservation Committee attempts to get help legally, legislatively, and from other agencies.

Montana has not been getting its share of the Public Law 566 construction funds which have been available because of lack of sufficient State planning funds. The recent legislature has helped out in this situation by providing the State Soil Conservation Committee with $100,000 to supplement Soil Conservation Service Planning. The State Soil Conservation Committee works very closely with the Soil Conservation Service to set priorities and in recommending planning authority.

MONTANA WATER POLLUTION CONTROL ACTIVITIES

By C. W. Brinck

Montana State Department of Health

An active water pollution control program has been carried out in Montana since 1955. Despite a great deal of publicity indicating that the nation's streams were being degraded, Montana has managed to consistently upgrade its streams and now has some of the cleanest streams in the nation. This has been due, in part, to the activities of the state stream pollution control agency. Early this month the Department of the Interior approved Montana water quality standards. This means a required removal of better than 90 per cent of organic wastes from our waters.

Federal legislation was enacted in 1965 in an attempt to upgrade the surface water supplies throughout the United States. This has required that all states develop water quality standards. Montana has had stringent standards since 1958. This year these standards were upgraded so that we now have more stringent requirements. The minimum amount of dissolved oxygen that must be maintained in the stream has been increased. The requirements concerning toxic materials including pesticides have been made more stringent and definite controls have been placed upon temperature—not permitting more than a two to four degree increase in the temperature of a stream due to man's activities in its entire length. These standards were adopted after a public hearing last year. They were modified to meet the requirements of the Federal Water Pollution Control Administration and the suggestions of those appearing at the public hearing. The modified standards were resubmitted to the FWPCA, who in turn submitted the proposals to the Secretary of Department of Interior, for final review and approval. Montana's first water pollution legislation was passed in 1909 with modifications in 1911 which permitted the State Board of Health to take action concerning water pollution only when it affected a public water supply or a surface stream or lake providing commercial ice. In 1955, a comprehensive pollution law was passed, which created the Montana Water Pollution Council of seven members having various interests including agriculture, fish and game, municipalities, industry, water conservation, and health. This council established policies which are carried out by the State Department of Health and is responsible for use classification of the waters of Montana and the establishment of water quality criteria. The activities of the Council through the Board of Health resulted in all sewered communities and industries in Montana providing treatment of their wastes. While the majority are doing an excellent job, there are some that must upgrade their waste treatment and a timetable has been established to provide that this will be done within the foreseeable future.

While many problems of waste disposal have been solved, one area where there still exists many problems involves the discharge of agricultural wastes.

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